autogluon_each_location

October 9, 2023

[1]:
```
# config

label = 'y'
metric = 'mean_absolute_error'
time_limit = 60*30
presets = 'best_quality'

do_drop_ds = True
# hour, dayofweek, dayofmonth, month, year
use_dt_attrs = []#"hour", "dayofweek", "day", "month", "year"]
use_estimated_diff_attr = False
use_is_estimated_attr = True

use_groups = False
n_groups = 8

auto_stack = False
num_stack_levels = 3
num_bag_folds = 8
if auto_stack:
    num_stack_levels = None
    num_bag_folds = None

use_tune_data = False
use_test_data = True
tune_and_test_length = 24*30*3 # 3 months from end, this changes the␣
 ↪evaluations for only test
holdout_frac = None
use_bag_holdout = False # Enable this if there is a large gap between score_val␣
 ↪and score_test in stack models.

sample_weight = None#'sample_weight' #None
weight_evaluation = False#True #False
sample_weight_estimated = 1 # this changes evaluations for test and tune WTF,␣
 ↪cant find a fix

run_analysis = False
```

[2]:
```
import pandas as pd
import numpy as np



import warnings
warnings.filterwarnings("ignore")

def fix_datetime(X, name):
    # Convert 'date_forecast' to datetime format and replace original column␣
 ↪with 'ds'
    X['ds'] = pd.to_datetime(X['date_forecast'])
    X.drop(columns=['date_forecast'], inplace=True, errors='ignore')
    X.sort_values(by='ds', inplace=True)
    X.set_index('ds', inplace=True)

    # Drop rows where the minute part of the time is not 0
    X = X[X.index.minute == 0].copy()
    return X



def convert_to_datetime(X_train_observed, X_train_estimated, X_test, y_train):
    X_train_observed = fix_datetime(X_train_observed, "X_train_observed")
    X_train_estimated = fix_datetime(X_train_estimated, "X_train_estimated")
    X_test = fix_datetime(X_test, "X_test")

    # add sample weights, which are 1 for observed and 3 for estimated
    X_train_observed["sample_weight"] = 1
    X_train_estimated["sample_weight"] = sample_weight_estimated
    X_test["sample_weight"] = sample_weight_estimated

    if use_estimated_diff_attr:
        X_train_observed["estimated_diff_hours"] = 0
        X_train_estimated["estimated_diff_hours"] = (X_train_estimated.index -␣
 ↪pd.to_datetime(X_train_estimated["date_calc"])).dt.total_seconds() / 3600
        X_test["estimated_diff_hours"] = (X_test.index - pd.
 ↪to_datetime(X_test["date_calc"])).dt.total_seconds() / 3600

        X_train_estimated["estimated_diff_hours"] =␣
 ↪X_train_estimated["estimated_diff_hours"].astype('int64')
        # the filled once will get dropped later anyways, when we drop y nans
        X_test["estimated_diff_hours"] = X_test["estimated_diff_hours"].
 ↪fillna(-50).astype('int64')

    if use_is_estimated_attr:
        X_train_observed["is_estimated"] = 0
```

```
        X_train_estimated["is_estimated"] = 1
        X_test["is_estimated"] = 1


    X_train_estimated.drop(columns=['date_calc'], inplace=True)
    X_test.drop(columns=['date_calc'], inplace=True)

    y_train['ds'] = pd.to_datetime(y_train['time'])
    y_train.drop(columns=['time'], inplace=True)
    y_train.sort_values(by='ds', inplace=True)
    y_train.set_index('ds', inplace=True)

    return X_train_observed, X_train_estimated, X_test, y_train




def preprocess_data(X_train_observed, X_train_estimated, X_test, y_train,␣
 ↪location):
    # convert to datetime
    X_train_observed, X_train_estimated, X_test, y_train =␣
 ↪convert_to_datetime(X_train_observed, X_train_estimated, X_test, y_train)

    y_train["y"] = y_train["pv_measurement"].astype('float64')
    y_train.drop(columns=['pv_measurement'], inplace=True)
    X_train = pd.concat([X_train_observed, X_train_estimated])

    # fill missng sample_weight with 3
    #X_train["sample_weight"] = X_train["sample_weight"].fillna(0)


    # clip all y values to 0 if negative
    y_train["y"] = y_train["y"].clip(lower=0)

    X_train = pd.merge(X_train, y_train, how="inner", left_index=True,␣
 ↪right_index=True)

    # print number of nans in sample_weight
    print(f"Number of nans in sample_weight: {X_train['sample_weight'].isna().
 ↪sum()}")
    # print number of nans in y
    print(f"Number of nans in y: {X_train['y'].isna().sum()}")


    X_train["location"] = location
    X_test["location"] = location
```

```
    return X_train, X_test
# Define locations
locations = ['A', 'B', 'C']

X_trains = []
X_tests = []
# Loop through locations
for loc in locations:
    print(f"Processing location {loc}...")
    # Read target training data
    y_train = pd.read_parquet(f'{loc}/train_targets.parquet')

    # Read estimated training data and add location feature
    X_train_estimated = pd.read_parquet(f'{loc}/X_train_estimated.parquet')

    # Read observed training data and add location feature
    X_train_observed= pd.read_parquet(f'{loc}/X_train_observed.parquet')

    # Read estimated test data and add location feature
    X_test_estimated = pd.read_parquet(f'{loc}/X_test_estimated.parquet')

    # Preprocess data
    X_train, X_test = preprocess_data(X_train_observed, X_train_estimated,␣
 ↪X_test_estimated, y_train, loc)

    X_trains.append(X_train)
    X_tests.append(X_test)

# Concatenate all data and save to csv
X_train = pd.concat(X_trains)
X_test = pd.concat(X_tests)
```

```
Processing location A…
Number of nans in sample_weight: 0
Number of nans in y: 0
Processing location B…
Number of nans in sample_weight: 0
Number of nans in y: 4
Processing location C…
Number of nans in sample_weight: 0
Number of nans in y: 6059
```

1 Feature enginering

[3]:
```
import numpy as np
import pandas as pd

X_train.dropna(subset=['y'], inplace=True)


for attr in use_dt_attrs:
    X_train[attr] = getattr(X_train.index, attr)
    X_test[attr] = getattr(X_test.index, attr)

print(X_train.head())




if use_groups:
    # fix groups for cross validation
    locations = X_train['location'].unique()  # Assuming 'location' is the name␣
 ↪of the column representing locations

    grouped_dfs = []  # To store data frames split by location

    # Loop through each unique location
    for loc in locations:
        loc_df = X_train[X_train['location'] == loc]

        # Sort the DataFrame for this location by the time column
        loc_df = loc_df.sort_index()

        # Calculate the size of each group for this location
        group_size = len(loc_df) // n_groups

        # Create a new 'group' column for this location
        loc_df['group'] = np.repeat(range(n_groups),␣
 ↪repeats=[group_size]*(n_groups-1) + [len(loc_df) - group_size*(n_groups-1)])

        # Append to list of grouped DataFrames
        grouped_dfs.append(loc_df)

    # Concatenate all the grouped DataFrames back together
    X_train = pd.concat(grouped_dfs)
    X_train.sort_index(inplace=True)
    print(X_train["group"].head())
```

```
to_drop = ["snow_drift:idx", "snow_density:kgm3"]

X_train.drop(columns=to_drop, inplace=True)
X_test.drop(columns=to_drop, inplace=True)

X_train.to_csv('X_train_raw.csv', index=True)
X_test.to_csv('X_test_raw.csv', index=True)
```

```
                    absolute_humidity_2m:gm3  air_density_2m:kgm3  \
ds
2019-06-02 22:00:00                       7.7                1.230
2019-06-02 23:00:00                       7.7                1.225
2019-06-03 00:00:00                       7.7                1.221
2019-06-03 01:00:00                       8.2                1.218
2019-06-03 02:00:00                       8.8                1.219

                    ceiling_height_agl:m  clear_sky_energy_1h:J  \
ds
2019-06-02 22:00:00           1744.900024               0.000000
2019-06-02 23:00:00           1703.599976               0.000000
2019-06-03 00:00:00           1668.099976               0.000000
2019-06-03 01:00:00           1388.400024               0.000000
2019-06-03 02:00:00           1108.500000            6546.899902

                    clear_sky_rad:W  cloud_base_agl:m  dew_or_rime:idx  \
ds
2019-06-02 22:00:00             0.0       1744.900024              0.0
2019-06-02 23:00:00             0.0       1703.599976              0.0
2019-06-03 00:00:00             0.0       1668.099976              0.0
2019-06-03 01:00:00             0.0       1388.400024              0.0
2019-06-03 02:00:00             9.8       1108.500000              0.0

                    dew_point_2m:K  diffuse_rad:W  diffuse_rad_1h:J  …  \
ds                                                                    …
2019-06-02 22:00:00      280.299988            0.0          0.000000  …
2019-06-02 23:00:00      280.299988            0.0          0.000000  …
2019-06-03 00:00:00      280.200012            0.0          0.000000  …
2019-06-03 01:00:00      281.299988            0.0          0.000000  …
2019-06-03 02:00:00      282.299988            4.3       7743.299805  …

                    total_cloud_cover:p  visibility:m  wind_speed_10m:ms  \
ds
2019-06-02 22:00:00                100.0  39640.101562                3.7
2019-06-02 23:00:00                100.0  41699.898438                3.5
2019-06-03 00:00:00                100.0  20473.000000                3.2
```

```
2019-06-03 01:00:00                100.0   2104.600098                2.8
2019-06-03 02:00:00                100.0   2681.600098                2.7

                     wind_speed_u_10m:ms  wind_speed_v_10m:ms  \
ds
2019-06-02 22:00:00                 -3.6                 -0.8
2019-06-02 23:00:00                 -3.5                  0.0
2019-06-03 00:00:00                 -3.1                  0.7
2019-06-03 01:00:00                 -2.7                  0.8
2019-06-03 02:00:00                 -2.5                  1.0

                     wind_speed_w_1000hPa:ms  sample_weight  is_estimated  \
ds
2019-06-02 22:00:00                     -0.0              1             0
2019-06-02 23:00:00                     -0.0              1             0
2019-06-03 00:00:00                     -0.0              1             0
2019-06-03 01:00:00                     -0.0              1             0
2019-06-03 02:00:00                     -0.0              1             0

                        y  location
ds
2019-06-02 22:00:00   0.00         A
2019-06-02 23:00:00   0.00         A
2019-06-03 00:00:00   0.00         A
2019-06-03 01:00:00   0.00         A
2019-06-03 02:00:00  19.36         A

[5 rows x 49 columns]
```

[4]:
```python
from autogluon.tabular import TabularDataset, TabularPredictor
from autogluon.timeseries import TimeSeriesDataFrame
import numpy as np
train_data = TabularDataset('X_train_raw.csv')
# set group column of train_data be increasing from 0 to 7 based on time, the␣
 ↪first 1/8 of the data is group 0, the second 1/8 of the data is group 1, etc.
train_data['ds'] = pd.to_datetime(train_data['ds'])
train_data = train_data.sort_values(by='ds')

# # print size of the group for each location
# for loc in locations:
#     print(f"Location {loc}:")
#     print(train_data[train_data["location"] == loc].groupby('group').size())


# get end date of train data and subtract 3 months
split_time = pd.to_datetime(train_data["ds"]).max() - pd.
 ↪Timedelta(hours=tune_and_test_length)
```

```
train_set = TabularDataset(train_data[train_data["ds"] < split_time])
test_set = TabularDataset(train_data[train_data["ds"] >= split_time])
if use_groups:
    test_set = test_set.drop(columns=['group'])

if do_drop_ds:
    train_set = train_set.drop(columns=['ds'])
    test_set = test_set.drop(columns=['ds'])
    train_data = train_data.drop(columns=['ds'])


def normalize_sample_weights_per_location(df):
    for loc in locations:
        loc_df = df[df["location"] == loc]
        loc_df["sample_weight"] = loc_df["sample_weight"] /␣
 ↪loc_df["sample_weight"].sum() * loc_df.shape[0]
        df[df["location"] == loc] = loc_df
    return df

tuning_data = None
if use_tune_data:
    train_data = train_set
    if use_test_data:
        # split test_set in half, use first half for tuning
        tuning_data, test_data = [], []
        for loc in locations:
            loc_test_set = test_set[test_set["location"] == loc]
            loc_tuning_data = loc_test_set.iloc[:len(loc_test_set)//2]
            loc_test_data = loc_test_set.iloc[len(loc_test_set)//2:]
            tuning_data.append(loc_tuning_data)
            test_data.append(loc_test_data)
        tuning_data = pd.concat(tuning_data)
        test_data = pd.concat(test_data)
        print("Shapes of tuning and test", tuning_data.shape[0], test_data.
 ↪shape[0], tuning_data.shape[0] + test_data.shape[0])

    else:
        tuning_data = test_set
        print("Shape of tuning", tuning_data.shape[0])

    # ensure sample weights for your tuning data sum to the number of rows in␣
 ↪the tuning data.
    tuning_data = normalize_sample_weights_per_location(tuning_data)


else:
    if use_test_data:
```

```
        train_data = train_set
        test_data = test_set
        print("Shape of test", test_data.shape[0])

# ensure sample weights for your training (or tuning) data sum to the number of␣
 ↪rows in the training (or tuning) data.
train_data = normalize_sample_weights_per_location(train_data)
if use_test_data:
    test_data = normalize_sample_weights_per_location(test_data)
```

```
Shape of test 5791
```

[5]:
```
if run_analysis:
    import autogluon.eda.auto as auto
    auto.dataset_overview(train_data=train_data, test_data=test_data,␣
 ↪label="y", sample=None)
```

[6]:
```
if run_analysis:
    auto.target_analysis(train_data=train_data, label="y")
```

2 Starting

[7]:
```
import os


# Get the last submission number
last_submission_number = int(max([int(filename.split('_')[1].split('.')[0]) for␣
 ↪filename in os.listdir('submissions') if "submission" in filename]))
print("Last submission number:", last_submission_number)
print("Now creating submission number:", last_submission_number + 1)

# Create the new filename
new_filename = f'submission_{last_submission_number + 1}'

hello = os.environ.get('HELLO')
if hello is not None:
    new_filename += f'_{hello}'

print("New filename:", new_filename)
```

```
Last submission number: 86
Now creating submission number: 87
New filename: submission_87
```

[8]:
```
predictors = [None, None, None]
```

[9]:
```
def fit_predictor_for_location(loc):
    print(f"Training model for location {loc}...")
    # sum of sample weights for this location, and number of rows, for both␣
↪train and tune data and test data
    print("Train data sample weight sum:", train_data[train_data["location"] ==␣
↪loc]["sample_weight"].sum())
    print("Train data number of rows:", train_data[train_data["location"] ==␣
↪loc].shape[0])
    if use_tune_data:
        print("Tune data sample weight sum:",␣
↪tuning_data[tuning_data["location"] == loc]["sample_weight"].sum())
        print("Tune data number of rows:", tuning_data[tuning_data["location"]␣
↪== loc].shape[0])
    if use_test_data:
        print("Test data sample weight sum:", test_data[test_data["location"]␣
↪== loc]["sample_weight"].sum())
        print("Test data number of rows:", test_data[test_data["location"] ==␣
↪loc].shape[0])
    predictor = TabularPredictor(
        label=label,
        eval_metric=metric,
        path=f"AutogluonModels/{new_filename}_{loc}",
        sample_weight=sample_weight,
        weight_evaluation=weight_evaluation,
        groups="group" if use_groups else None,
    ).fit(
        train_data=train_data[train_data["location"] == loc],
        time_limit=time_limit,
        #presets=presets,
        num_stack_levels=num_stack_levels,
        num_bag_folds=num_bag_folds if not use_groups else 2,# just put␣
↪somethin, will be overwritten anyways
        tuning_data=tuning_data[tuning_data["location"] == loc] if␣
↪use_tune_data else None,
        use_bag_holdout=use_bag_holdout,
        holdout_frac=holdout_frac,
    )

    # evaluate on test data
    if use_test_data:
        # drop sample_weight column
        t = test_data[test_data["location"] == loc]#.
↪drop(columns=["sample_weight"])
        perf = predictor.evaluate(t)
        print("Evaluation on test data:")
        print(perf[predictor.eval_metric.name])
```

```
    return predictor

loc = "A"
predictors[0] = fit_predictor_for_location(loc)
```

```
Warning: path already exists! This predictor may overwrite an existing
predictor! path="AutogluonModels/submission_87_A"
Beginning AutoGluon training … Time limit = 1800s
AutoGluon will save models to "AutogluonModels/submission_87_A/"
AutoGluon Version:  0.8.2
Python Version:     3.10.12
Operating System:   Linux
Platform Machine:   x86_64
Platform Version:   #1 SMP Debian 5.10.197-1 (2023-09-29)
Disk Space Avail:   302.55 GB / 315.93 GB (95.8%)
Train Data Rows:    31900
Train Data Columns: 46
Label Column: y
Preprocessing data …

Training model for location A…
Train data sample weight sum: 31900
Train data number of rows: 31900
Test data sample weight sum: 2161
Test data number of rows: 2161

AutoGluon infers your prediction problem is: 'regression' (because dtype of
label-column == float and many unique label-values observed).
        Label info (max, min, mean, stddev): (5733.42, 0.0, 633.132, 1165.64686)
        If 'regression' is not the correct problem_type, please manually specify
the problem_type parameter during predictor init (You may specify problem_type
as one of: ['binary', 'multiclass', 'regression'])
Using Feature Generators to preprocess the data …
Fitting AutoMLPipelineFeatureGenerator…
        Available Memory:                    132460.7 MB
        Train Data (Original)  Memory Usage: 13.33 MB (0.0% of available memory)
        Inferring data type of each feature based on column values. Set
feature_metadata_in to manually specify special dtypes of the features.
        Stage 1 Generators:
                Fitting AsTypeFeatureGenerator…
                        Note: Converting 4 features to boolean dtype as they
only contain 2 unique values.
        Stage 2 Generators:
                Fitting FillNaFeatureGenerator…
        Stage 3 Generators:
                Fitting IdentityFeatureGenerator…
        Stage 4 Generators:
                Fitting DropUniqueFeatureGenerator…
```

```
        Stage 5 Generators:
                Fitting DropDuplicatesFeatureGenerator…
        Useless Original Features (Count: 3): ['elevation:m', 'sample_weight',
'location']
                These features carry no predictive signal and should be manually
investigated.
                This is typically a feature which has the same value for all
rows.
                These features do not need to be present at inference time.
        Types of features in original data (raw dtype, special dtypes):
                ('float', []) : 42 | ['absolute_humidity_2m:gm3',
'air_density_2m:kgm3', 'ceiling_height_agl:m', 'clear_sky_energy_1h:J',
'clear_sky_rad:W', …]
                ('int', [])   :  1 | ['is_estimated']
        Types of features in processed data (raw dtype, special dtypes):
                ('float', [])     : 39 | ['absolute_humidity_2m:gm3',
'air_density_2m:kgm3', 'ceiling_height_agl:m', 'clear_sky_energy_1h:J',
'clear_sky_rad:W', …]
                ('int', ['bool']) :  4 | ['is_day:idx', 'is_in_shadow:idx',
'wind_speed_w_1000hPa:ms', 'is_estimated']
        0.2s = Fit runtime
        43 features in original data used to generate 43 features in processed
data.
        Train Data (Processed) Memory Usage: 10.08 MB (0.0% of available memory)
Data preprocessing and feature engineering runtime = 0.22s …
AutoGluon will gauge predictive performance using evaluation metric:
'mean_absolute_error'
        This metric's sign has been flipped to adhere to being higher_is_better.
The metric score can be multiplied by -1 to get the metric value.
        To change this, specify the eval_metric parameter of Predictor()
User-specified model hyperparameters to be fit:
{
        'NN_TORCH': {},
        'GBM': [{'extra_trees': True, 'ag_args': {'name_suffix': 'XT'}}, {},
'GBMLarge'],
        'CAT': {},
        'XGB': {},
        'FASTAI': {},
        'RF': [{'criterion': 'gini', 'ag_args': {'name_suffix': 'Gini',
'problem_types': ['binary', 'multiclass']}}, {'criterion': 'entropy', 'ag_args':
{'name_suffix': 'Entr', 'problem_types': ['binary', 'multiclass']}},
{'criterion': 'squared_error', 'ag_args': {'name_suffix': 'MSE',
'problem_types': ['regression', 'quantile']}}],
        'XT': [{'criterion': 'gini', 'ag_args': {'name_suffix': 'Gini',
'problem_types': ['binary', 'multiclass']}}, {'criterion': 'entropy', 'ag_args':
{'name_suffix': 'Entr', 'problem_types': ['binary', 'multiclass']}},
{'criterion': 'squared_error', 'ag_args': {'name_suffix': 'MSE',
'problem_types': ['regression', 'quantile']}}],
```

```
        'KNN': [{'weights': 'uniform', 'ag_args': {'name_suffix': 'Unif'}},
{'weights': 'distance', 'ag_args': {'name_suffix': 'Dist'}}],
}
AutoGluon will fit 4 stack levels (L1 to L4) …
Fitting 11 L1 models …
Fitting model: KNeighborsUnif_BAG_L1 … Training model for up to 599.77s of the
1799.77s of remaining time.
        -299.6339       = Validation score   (-mean_absolute_error)
        0.04s    = Training   runtime
        0.4s     = Validation runtime
Fitting model: KNeighborsDist_BAG_L1 … Training model for up to 599.26s of the
1799.25s of remaining time.
        -300.6895       = Validation score   (-mean_absolute_error)
        0.04s    = Training   runtime
        0.4s     = Validation runtime
Fitting model: LightGBMXT_BAG_L1 … Training model for up to 598.77s of the
1798.77s of remaining time.
        Fitting 8 child models (S1F1 - S1F8) | Fitting with
ParallelLocalFoldFittingStrategy
        -174.1111       = Validation score   (-mean_absolute_error)
        31.28s   = Training   runtime
        12.66s   = Validation runtime
Fitting model: LightGBM_BAG_L1 … Training model for up to 559.48s of the
1759.48s of remaining time.
        Fitting 8 child models (S1F1 - S1F8) | Fitting with
ParallelLocalFoldFittingStrategy
        -179.844        = Validation score   (-mean_absolute_error)
        30.26s   = Training   runtime
        7.54s    = Validation runtime
Fitting model: RandomForestMSE_BAG_L1 … Training model for up to 526.71s of
the 1726.7s of remaining time.
        -192.1045       = Validation score   (-mean_absolute_error)
        8.18s    = Training   runtime
        1.19s    = Validation runtime
Fitting model: CatBoost_BAG_L1 … Training model for up to 516.71s of the
1716.71s of remaining time.
        Fitting 8 child models (S1F1 - S1F8) | Fitting with
ParallelLocalFoldFittingStrategy
        -185.8683       = Validation score   (-mean_absolute_error)
        202.61s  = Training   runtime
        0.09s    = Validation runtime
Fitting model: ExtraTreesMSE_BAG_L1 … Training model for up to 313.04s of the
1513.04s of remaining time.
        -191.928        = Validation score   (-mean_absolute_error)
        1.86s    = Training   runtime
        1.19s    = Validation runtime
Fitting model: NeuralNetFastAI_BAG_L1 … Training model for up to 309.35s of
the 1509.35s of remaining time.
```

```
        Fitting 8 child models (S1F1 - S1F8) | Fitting with
ParallelLocalFoldFittingStrategy
        -196.7164       = Validation score   (-mean_absolute_error)
        38.74s   = Training   runtime
        0.52s    = Validation runtime
Fitting model: XGBoost_BAG_L1 … Training model for up to 269.51s of the
1469.51s of remaining time.
        Fitting 8 child models (S1F1 - S1F8) | Fitting with
ParallelLocalFoldFittingStrategy
        -189.9447       = Validation score   (-mean_absolute_error)
        9.51s    = Training   runtime
        0.4s     = Validation runtime
Fitting model: NeuralNetTorch_BAG_L1 … Training model for up to 258.17s of the
1458.16s of remaining time.
        Fitting 8 child models (S1F1 - S1F8) | Fitting with
ParallelLocalFoldFittingStrategy
        -180.7681       = Validation score   (-mean_absolute_error)
        113.22s  = Training   runtime
        0.4s     = Validation runtime
Fitting model: LightGBMLarge_BAG_L1 … Training model for up to 143.73s of the
1343.73s of remaining time.
        Fitting 8 child models (S1F1 - S1F8) | Fitting with
ParallelLocalFoldFittingStrategy
        -174.2225       = Validation score   (-mean_absolute_error)
        107.45s  = Training   runtime
        22.9s    = Validation runtime
Completed 1/20 k-fold bagging repeats …
Fitting model: WeightedEnsemble_L2 … Training model for up to 360.0s of the
1231.44s of remaining time.
        -167.0368       = Validation score   (-mean_absolute_error)
        0.72s    = Training   runtime
        0.0s     = Validation runtime
Fitting 9 L2 models …
Fitting model: LightGBMXT_BAG_L2 … Training model for up to 546.84s of the
1230.69s of remaining time.
        Fitting 8 child models (S1F1 - S1F8) | Fitting with
ParallelLocalFoldFittingStrategy
        -170.4449       = Validation score   (-mean_absolute_error)
        2.33s    = Training   runtime
        0.13s    = Validation runtime
Fitting model: LightGBM_BAG_L2 … Training model for up to 543.29s of the
1227.14s of remaining time.
        Fitting 8 child models (S1F1 - S1F8) | Fitting with
ParallelLocalFoldFittingStrategy
        -168.9571       = Validation score   (-mean_absolute_error)
        2.18s    = Training   runtime
        0.08s    = Validation runtime
Fitting model: RandomForestMSE_BAG_L2 … Training model for up to 539.79s of
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the 1223.64s of remaining time.
        -168.343        = Validation score   (-mean_absolute_error)
        14.75s   = Training   runtime
        1.32s    = Validation runtime
Fitting model: CatBoost_BAG_L2 … Training model for up to 523.06s of the
1206.91s of remaining time.
        Fitting 8 child models (S1F1 - S1F8) | Fitting with
ParallelLocalFoldFittingStrategy
        -168.554        = Validation score   (-mean_absolute_error)
        4.36s    = Training   runtime
        0.04s    = Validation runtime
Fitting model: ExtraTreesMSE_BAG_L2 … Training model for up to 517.51s of the
1201.35s of remaining time.
        -167.805        = Validation score   (-mean_absolute_error)
        2.59s    = Training   runtime
        1.31s    = Validation runtime
Fitting model: NeuralNetFastAI_BAG_L2 … Training model for up to 512.94s of
the 1196.79s of remaining time.
        Fitting 8 child models (S1F1 - S1F8) | Fitting with
ParallelLocalFoldFittingStrategy
        -166.8606       = Validation score   (-mean_absolute_error)
        39.44s   = Training   runtime
        0.49s    = Validation runtime
Fitting model: XGBoost_BAG_L2 … Training model for up to 472.17s of the
1156.02s of remaining time.
        Fitting 8 child models (S1F1 - S1F8) | Fitting with
ParallelLocalFoldFittingStrategy
        -168.3036       = Validation score   (-mean_absolute_error)
        2.67s    = Training   runtime
        0.11s    = Validation runtime
Fitting model: NeuralNetTorch_BAG_L2 … Training model for up to 468.1s of the
1151.94s of remaining time.
        Fitting 8 child models (S1F1 - S1F8) | Fitting with
ParallelLocalFoldFittingStrategy
        -167.6763       = Validation score   (-mean_absolute_error)
        50.57s   = Training   runtime
        0.52s    = Validation runtime
Fitting model: LightGBMLarge_BAG_L2 … Training model for up to 416.26s of the
1100.1s of remaining time.
        Fitting 8 child models (S1F1 - S1F8) | Fitting with
ParallelLocalFoldFittingStrategy
        -169.6263       = Validation score   (-mean_absolute_error)
        6.17s    = Training   runtime
        0.22s    = Validation runtime
Repeating k-fold bagging: 2/20
Fitting model: LightGBMXT_BAG_L2 … Training model for up to 408.78s of the
1092.63s of remaining time.
        Fitting 8 child models (S2F1 - S2F8) | Fitting with
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ParallelLocalFoldFittingStrategy
        -169.5589       = Validation score   (-mean_absolute_error)
        4.66s    = Training   runtime
        0.27s    = Validation runtime
Fitting model: LightGBM_BAG_L2 … Training model for up to 405.14s of the
1088.99s of remaining time.
        Fitting 8 child models (S2F1 - S2F8) | Fitting with
ParallelLocalFoldFittingStrategy
        -168.0902       = Validation score   (-mean_absolute_error)
        4.07s    = Training   runtime
        0.16s    = Validation runtime
Fitting model: CatBoost_BAG_L2 … Training model for up to 401.91s of the
1085.75s of remaining time.
        Fitting 8 child models (S2F1 - S2F8) | Fitting with
ParallelLocalFoldFittingStrategy
        -168.0431       = Validation score   (-mean_absolute_error)
        9.62s    = Training   runtime
        0.08s    = Validation runtime
Fitting model: NeuralNetFastAI_BAG_L2 … Training model for up to 395.33s of
the 1079.18s of remaining time.
        Fitting 8 child models (S2F1 - S2F8) | Fitting with
ParallelLocalFoldFittingStrategy
        -166.2009       = Validation score   (-mean_absolute_error)
        79.31s   = Training   runtime
        0.98s    = Validation runtime
Fitting model: XGBoost_BAG_L2 … Training model for up to 354.17s of the
1038.02s of remaining time.
        Fitting 8 child models (S2F1 - S2F8) | Fitting with
ParallelLocalFoldFittingStrategy
        -167.4693       = Validation score   (-mean_absolute_error)
        5.42s    = Training   runtime
        0.23s    = Validation runtime
Fitting model: NeuralNetTorch_BAG_L2 … Training model for up to 350.06s of the
1033.9s of remaining time.
        Fitting 8 child models (S2F1 - S2F8) | Fitting with
ParallelLocalFoldFittingStrategy
        -166.5435       = Validation score   (-mean_absolute_error)
        91.3s    = Training   runtime
        1.06s    = Validation runtime
Fitting model: LightGBMLarge_BAG_L2 … Training model for up to 308.04s of the
991.89s of remaining time.
        Fitting 8 child models (S2F1 - S2F8) | Fitting with
ParallelLocalFoldFittingStrategy
        -168.7157       = Validation score   (-mean_absolute_error)
        12.07s   = Training   runtime
        0.39s    = Validation runtime
Repeating k-fold bagging: 3/20
Fitting model: LightGBMXT_BAG_L2 … Training model for up to 300.9s of the
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984.75s of remaining time.
        Fitting 8 child models (S3F1 - S3F8) | Fitting with
ParallelLocalFoldFittingStrategy
        -169.1559       = Validation score   (-mean_absolute_error)
        7.2s    = Training   runtime
        0.41s   = Validation runtime
Fitting model: LightGBM_BAG_L2 … Training model for up to 297.16s of the
981.0s of remaining time.
        Fitting 8 child models (S3F1 - S3F8) | Fitting with
ParallelLocalFoldFittingStrategy
        -167.783        = Validation score   (-mean_absolute_error)
        6.01s   = Training   runtime
        0.24s   = Validation runtime
Fitting model: CatBoost_BAG_L2 … Training model for up to 293.95s of the
977.79s of remaining time.
        Fitting 8 child models (S3F1 - S3F8) | Fitting with
ParallelLocalFoldFittingStrategy
        -168.0872       = Validation score   (-mean_absolute_error)
        14.16s  = Training   runtime
        0.12s   = Validation runtime
Fitting model: NeuralNetFastAI_BAG_L2 … Training model for up to 288.08s of
the 971.93s of remaining time.
        Fitting 8 child models (S3F1 - S3F8) | Fitting with
ParallelLocalFoldFittingStrategy
        -165.9411       = Validation score   (-mean_absolute_error)
        119.1s  = Training   runtime
        1.48s   = Validation runtime
Fitting model: XGBoost_BAG_L2 … Training model for up to 246.96s of the
930.81s of remaining time.
        Fitting 8 child models (S3F1 - S3F8) | Fitting with
ParallelLocalFoldFittingStrategy
        -167.1724       = Validation score   (-mean_absolute_error)
        8.14s   = Training   runtime
        0.34s   = Validation runtime
Fitting model: NeuralNetTorch_BAG_L2 … Training model for up to 242.89s of the
926.74s of remaining time.
        Fitting 8 child models (S3F1 - S3F8) | Fitting with
ParallelLocalFoldFittingStrategy
        -166.1757       = Validation score   (-mean_absolute_error)
        132.98s  = Training   runtime
        1.67s   = Validation runtime
Fitting model: LightGBMLarge_BAG_L2 … Training model for up to 199.98s of the
883.83s of remaining time.
        Fitting 8 child models (S3F1 - S3F8) | Fitting with
ParallelLocalFoldFittingStrategy
        -168.0825       = Validation score   (-mean_absolute_error)
        18.51s  = Training   runtime
        0.58s   = Validation runtime
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Repeating k-fold bagging: 4/20
Fitting model: LightGBMXT_BAG_L2 … Training model for up to 192.27s of the
876.12s of remaining time.
        Fitting 8 child models (S4F1 - S4F8) | Fitting with
ParallelLocalFoldFittingStrategy
        -169.0179       = Validation score   (-mean_absolute_error)
        9.9s     = Training   runtime
        0.57s    = Validation runtime
Fitting model: LightGBM_BAG_L2 … Training model for up to 188.26s of the
872.1s of remaining time.
        Fitting 8 child models (S4F1 - S4F8) | Fitting with
ParallelLocalFoldFittingStrategy
        -167.6271       = Validation score   (-mean_absolute_error)
        7.94s    = Training   runtime
        0.32s    = Validation runtime
Fitting model: CatBoost_BAG_L2 … Training model for up to 185.03s of the
868.88s of remaining time.
        Fitting 8 child models (S4F1 - S4F8) | Fitting with
ParallelLocalFoldFittingStrategy
        -168.101        = Validation score   (-mean_absolute_error)
        20.24s   = Training   runtime
        0.15s    = Validation runtime
Fitting model: NeuralNetFastAI_BAG_L2 … Training model for up to 177.56s of
the 861.4s of remaining time.
        Fitting 8 child models (S4F1 - S4F8) | Fitting with
ParallelLocalFoldFittingStrategy
        -165.8368       = Validation score   (-mean_absolute_error)
        159.14s  = Training   runtime
        1.98s    = Validation runtime
Fitting model: XGBoost_BAG_L2 … Training model for up to 136.26s of the
820.11s of remaining time.
        Fitting 8 child models (S4F1 - S4F8) | Fitting with
ParallelLocalFoldFittingStrategy
        -166.9785       = Validation score   (-mean_absolute_error)
        10.75s   = Training   runtime
        0.46s    = Validation runtime
Fitting model: NeuralNetTorch_BAG_L2 … Training model for up to 132.15s of the
816.0s of remaining time.
        Fitting 8 child models (S4F1 - S4F8) | Fitting with
ParallelLocalFoldFittingStrategy
        -166.1078       = Validation score   (-mean_absolute_error)
        171.31s  = Training   runtime
        2.2s     = Validation runtime
Fitting model: LightGBMLarge_BAG_L2 … Training model for up to 92.37s of the
776.22s of remaining time.
        Fitting 8 child models (S4F1 - S4F8) | Fitting with
ParallelLocalFoldFittingStrategy
        -167.9751       = Validation score   (-mean_absolute_error)
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        24.93s   = Training   runtime
        0.77s    = Validation runtime
Completed 4/20 k-fold bagging repeats …
Fitting model: WeightedEnsemble_L3 … Training model for up to 360.0s of the
768.53s of remaining time.
        -163.5561        = Validation score   (-mean_absolute_error)
        0.59s    = Training   runtime
        0.0s     = Validation runtime
Fitting 9 L3 models …
Fitting model: LightGBMXT_BAG_L3 … Training model for up to 511.82s of the
767.9s of remaining time.
        Fitting 8 child models (S1F1 - S1F8) | Fitting with
ParallelLocalFoldFittingStrategy
        -169.5965        = Validation score   (-mean_absolute_error)
        1.87s    = Training   runtime
        0.1s     = Validation runtime
Fitting model: LightGBM_BAG_L3 … Training model for up to 508.77s of the
764.86s of remaining time.
        Fitting 8 child models (S1F1 - S1F8) | Fitting with
ParallelLocalFoldFittingStrategy
        -168.9985        = Validation score   (-mean_absolute_error)
        2.18s    = Training   runtime
        0.08s    = Validation runtime
Fitting model: RandomForestMSE_BAG_L3 … Training model for up to 505.26s of
the 761.34s of remaining time.
        -167.3699        = Validation score   (-mean_absolute_error)
        14.08s   = Training   runtime
        1.23s    = Validation runtime
Fitting model: CatBoost_BAG_L3 … Training model for up to 489.3s of the
745.39s of remaining time.
        Fitting 8 child models (S1F1 - S1F8) | Fitting with
ParallelLocalFoldFittingStrategy
        -167.7881        = Validation score   (-mean_absolute_error)
        3.87s    = Training   runtime
        0.04s    = Validation runtime
Fitting model: ExtraTreesMSE_BAG_L3 … Training model for up to 484.25s of the
740.34s of remaining time.
        -167.2583        = Validation score   (-mean_absolute_error)
        2.46s    = Training   runtime
        1.23s    = Validation runtime
Fitting model: NeuralNetFastAI_BAG_L3 … Training model for up to 479.9s of the
735.99s of remaining time.
        Fitting 8 child models (S1F1 - S1F8) | Fitting with
ParallelLocalFoldFittingStrategy
        -166.6116        = Validation score   (-mean_absolute_error)
        39.15s   = Training   runtime
        0.53s    = Validation runtime
Fitting model: XGBoost_BAG_L3 … Training model for up to 439.45s of the
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695.54s of remaining time.
        Fitting 8 child models (S1F1 - S1F8) | Fitting with
ParallelLocalFoldFittingStrategy
        -167.6172       = Validation score   (-mean_absolute_error)
        2.93s    = Training   runtime
        0.12s    = Validation runtime
Fitting model: NeuralNetTorch_BAG_L3 … Training model for up to 435.25s of the
691.34s of remaining time.
        Fitting 8 child models (S1F1 - S1F8) | Fitting with
ParallelLocalFoldFittingStrategy
        -165.3506       = Validation score   (-mean_absolute_error)
        36.41s   = Training   runtime
        0.52s    = Validation runtime
Fitting model: LightGBMLarge_BAG_L3 … Training model for up to 397.58s of the
653.67s of remaining time.
        Fitting 8 child models (S1F1 - S1F8) | Fitting with
ParallelLocalFoldFittingStrategy
        -169.1751       = Validation score   (-mean_absolute_error)
        5.32s    = Training   runtime
        0.16s    = Validation runtime
Repeating k-fold bagging: 2/20
Fitting model: LightGBMXT_BAG_L3 … Training model for up to 391.01s of the
647.1s of remaining time.
        Fitting 8 child models (S2F1 - S2F8) | Fitting with
ParallelLocalFoldFittingStrategy
        -168.9777       = Validation score   (-mean_absolute_error)
        3.72s    = Training   runtime
        0.19s    = Validation runtime
Fitting model: LightGBM_BAG_L3 … Training model for up to 387.91s of the
644.0s of remaining time.
        Fitting 8 child models (S2F1 - S2F8) | Fitting with
ParallelLocalFoldFittingStrategy
        -167.8651       = Validation score   (-mean_absolute_error)
        4.33s    = Training   runtime
        0.16s    = Validation runtime
Fitting model: CatBoost_BAG_L3 … Training model for up to 384.56s of the
640.65s of remaining time.
        Fitting 8 child models (S2F1 - S2F8) | Fitting with
ParallelLocalFoldFittingStrategy
        -167.4067       = Validation score   (-mean_absolute_error)
        7.32s    = Training   runtime
        0.08s    = Validation runtime
Fitting model: NeuralNetFastAI_BAG_L3 … Training model for up to 379.77s of
the 635.86s of remaining time.
        Fitting 8 child models (S2F1 - S2F8) | Fitting with
ParallelLocalFoldFittingStrategy
        -165.8049       = Validation score   (-mean_absolute_error)
        78.96s   = Training   runtime
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        1.07s    = Validation runtime
Fitting model: XGBoost_BAG_L3 … Training model for up to 338.6s of the 594.69s
of remaining time.
        Fitting 8 child models (S2F1 - S2F8) | Fitting with
ParallelLocalFoldFittingStrategy
        -166.9316        = Validation score   (-mean_absolute_error)
        5.46s    = Training   runtime
        0.23s    = Validation runtime
Fitting model: NeuralNetTorch_BAG_L3 … Training model for up to 334.85s of the
590.94s of remaining time.
        Fitting 8 child models (S2F1 - S2F8) | Fitting with
ParallelLocalFoldFittingStrategy
        -164.6459        = Validation score   (-mean_absolute_error)
        76.02s   = Training   runtime
        1.0s     = Validation runtime
Fitting model: LightGBMLarge_BAG_L3 … Training model for up to 294.01s of the
550.1s of remaining time.
        Fitting 8 child models (S2F1 - S2F8) | Fitting with
ParallelLocalFoldFittingStrategy
        -167.8552        = Validation score   (-mean_absolute_error)
        11.37s   = Training   runtime
        0.35s    = Validation runtime
Repeating k-fold bagging: 3/20
Fitting model: LightGBMXT_BAG_L3 … Training model for up to 286.74s of the
542.83s of remaining time.
        Fitting 8 child models (S3F1 - S3F8) | Fitting with
ParallelLocalFoldFittingStrategy
        -168.8175        = Validation score   (-mean_absolute_error)
        5.51s    = Training   runtime
        0.28s    = Validation runtime
Fitting model: LightGBM_BAG_L3 … Training model for up to 283.76s of the
539.85s of remaining time.
        Fitting 8 child models (S3F1 - S3F8) | Fitting with
ParallelLocalFoldFittingStrategy
        -167.4138        = Validation score   (-mean_absolute_error)
        6.31s    = Training   runtime
        0.24s    = Validation runtime
Fitting model: CatBoost_BAG_L3 … Training model for up to 280.48s of the
536.57s of remaining time.
        Fitting 8 child models (S3F1 - S3F8) | Fitting with
ParallelLocalFoldFittingStrategy
        -167.3887        = Validation score   (-mean_absolute_error)
        10.81s   = Training   runtime
        0.11s    = Validation runtime
Fitting model: NeuralNetFastAI_BAG_L3 … Training model for up to 275.65s of
the 531.74s of remaining time.
        Fitting 8 child models (S3F1 - S3F8) | Fitting with
ParallelLocalFoldFittingStrategy
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        -165.6509       = Validation score   (-mean_absolute_error)
        -166.5318       = Validation score   (-mean_absolute_error)
        8.15s    = Training   runtime
        0.34s    = Validation runtime
Fitting model: NeuralNetTorch_BAG_L3 … Training model for up to 230.58s of the
486.67s of remaining time.
        Fitting 8 child models (S3F1 - S3F8) | Fitting with
ParallelLocalFoldFittingStrategy
        -164.3146       = Validation score   (-mean_absolute_error)
        122.61s  = Training   runtime
        1.52s    = Validation runtime
Fitting model: LightGBMLarge_BAG_L3 … Training model for up to 182.74s of the
438.83s of remaining time.
        Fitting 8 child models (S3F1 - S3F8) | Fitting with
ParallelLocalFoldFittingStrategy
        -165.5277       = Validation score   (-mean_absolute_error)
        158.17s  = Training   runtime
        2.09s    = Validation runtime
Fitting model: XGBoost_BAG_L3 … Training model for up to 122.68s of the
378.77s of remaining time.
        Fitting 8 child models (S4F1 - S4F8) | Fitting with
ParallelLocalFoldFittingStrategy
        -166.2483       = Validation score   (-mean_absolute_error)
        10.71s   = Training   runtime
        0.46s    = Validation runtime
Fitting model: NeuralNetTorch_BAG_L3 … Training model for up to 118.75s of the
374.84s of remaining time.
        Fitting 8 child models (S4F1 - S4F8) | Fitting with
ParallelLocalFoldFittingStrategy
        -164.1777       = Validation score   (-mean_absolute_error)
        163.6s   = Training   runtime
        2.28s    = Validation runtime
Fitting model: LightGBMLarge_BAG_L3 … Training model for up to 76.47s of the
332.56s of remaining time.
        Fitting 8 child models (S4F1 - S4F8) | Fitting with
ParallelLocalFoldFittingStrategy
        -167.0436       = Validation score   (-mean_absolute_error)
        22.49s   = Training   runtime
        0.71s    = Validation runtime
Completed 4/20 k-fold bagging repeats …
Fitting model: WeightedEnsemble_L4 … Training model for up to 360.0s of the
325.93s of remaining time.
        -163.0614       = Validation score   (-mean_absolute_error)
        0.6s     = Training   runtime
        0.0s     = Validation runtime
Fitting 9 L4 models …
Fitting model: LightGBMXT_BAG_L4 … Training model for up to 325.31s of the
325.3s of remaining time.
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        Fitting 8 child models (S1F1 - S1F8) | Fitting with
ParallelLocalFoldFittingStrategy
        -169.1116       = Validation score   (-mean_absolute_error)
        1.83s    = Training   runtime
        0.09s    = Validation runtime
Fitting model: LightGBM_BAG_L4 … Training model for up to 322.26s of the
322.25s of remaining time.
        Fitting 8 child models (S1F1 - S1F8) | Fitting with
ParallelLocalFoldFittingStrategy
        -167.752        = Validation score   (-mean_absolute_error)
        2.03s    = Training   runtime
        0.08s    = Validation runtime
Fitting model: RandomForestMSE_BAG_L4 … Training model for up to 319.03s of
the 319.02s of remaining time.
        -166.2977       = Validation score   (-mean_absolute_error)
        13.6s    = Training   runtime
        1.25s    = Validation runtime
Fitting model: CatBoost_BAG_L4 … Training model for up to 303.54s of the
303.53s of remaining time.
        Fitting 8 child models (S1F1 - S1F8) | Fitting with
ParallelLocalFoldFittingStrategy
        -167.4687       = Validation score   (-mean_absolute_error)
        3.59s    = Training   runtime
        0.04s    = Validation runtime
Fitting model: ExtraTreesMSE_BAG_L4 … Training model for up to 298.79s of the
298.78s of remaining time.
        -166.2655       = Validation score   (-mean_absolute_error)
        2.47s    = Training   runtime
        1.22s    = Validation runtime
Fitting model: NeuralNetFastAI_BAG_L4 … Training model for up to 294.46s of
the 294.44s of remaining time.
        Fitting 8 child models (S1F1 - S1F8) | Fitting with
ParallelLocalFoldFittingStrategy
        -167.2927       = Validation score   (-mean_absolute_error)
        39.7s    = Training   runtime
        0.5s     = Validation runtime
Fitting model: XGBoost_BAG_L4 … Training model for up to 253.49s of the
253.48s of remaining time.
        Fitting 8 child models (S1F1 - S1F8) | Fitting with
ParallelLocalFoldFittingStrategy
        -167.4524       = Validation score   (-mean_absolute_error)
        2.91s    = Training   runtime
        0.13s    = Validation runtime
Fitting model: NeuralNetTorch_BAG_L4 … Training model for up to 249.29s of the
249.28s of remaining time.
        Fitting 8 child models (S1F1 - S1F8) | Fitting with
ParallelLocalFoldFittingStrategy
        -165.3646       = Validation score   (-mean_absolute_error)
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        40.22s    = Training   runtime
        0.62s     = Validation runtime
Fitting model: LightGBMLarge_BAG_L4 … Training model for up to 207.62s of the
207.61s of remaining time.
        Fitting 8 child models (S1F1 - S1F8) | Fitting with
ParallelLocalFoldFittingStrategy
        -167.8075         = Validation score   (-mean_absolute_error)
        6.33s     = Training   runtime
        0.18s     = Validation runtime
Repeating k-fold bagging: 2/20
Fitting model: LightGBMXT_BAG_L4 … Training model for up to 199.93s of the
199.92s of remaining time.
        Fitting 8 child models (S2F1 - S2F8) | Fitting with
ParallelLocalFoldFittingStrategy
        -168.698          = Validation score   (-mean_absolute_error)
        3.7s      = Training   runtime
        0.18s     = Validation runtime
Fitting model: LightGBM_BAG_L4 … Training model for up to 196.9s of the
196.89s of remaining time.
        Fitting 8 child models (S2F1 - S2F8) | Fitting with
ParallelLocalFoldFittingStrategy
        -167.4411         = Validation score   (-mean_absolute_error)
        4.0s      = Training   runtime
        0.16s     = Validation runtime
Fitting model: CatBoost_BAG_L4 … Training model for up to 193.72s of the
193.7s of remaining time.
        Fitting 8 child models (S2F1 - S2F8) | Fitting with
ParallelLocalFoldFittingStrategy
        -167.2325         = Validation score   (-mean_absolute_error)
        7.15s     = Training   runtime
        0.07s     = Validation runtime
Fitting model: NeuralNetFastAI_BAG_L4 … Training model for up to 188.97s of
the 188.96s of remaining time.
        Fitting 8 child models (S2F1 - S2F8) | Fitting with
ParallelLocalFoldFittingStrategy
        -165.9181         = Validation score   (-mean_absolute_error)
        79.56s    = Training   runtime
        1.0s      = Validation runtime
Fitting model: XGBoost_BAG_L4 … Training model for up to 147.74s of the
147.73s of remaining time.
        Fitting 8 child models (S2F1 - S2F8) | Fitting with
ParallelLocalFoldFittingStrategy
        -166.9144         = Validation score   (-mean_absolute_error)
        5.44s     = Training   runtime
        0.24s     = Validation runtime
Fitting model: NeuralNetTorch_BAG_L4 … Training model for up to 143.96s of the
143.95s of remaining time.
        Fitting 8 child models (S2F1 - S2F8) | Fitting with
```

```
ParallelLocalFoldFittingStrategy
        -164.6149       = Validation score   (-mean_absolute_error)
        87.39s    = Training   runtime
        1.11s     = Validation runtime
Fitting model: LightGBMLarge_BAG_L4 … Training model for up to 95.53s of the
95.52s of remaining time.
        Fitting 8 child models (S2F1 - S2F8) | Fitting with
ParallelLocalFoldFittingStrategy
        -166.8029       = Validation score   (-mean_absolute_error)
        12.22s    = Training   runtime
        0.36s     = Validation runtime
Completed 2/20 k-fold bagging repeats …
Fitting model: WeightedEnsemble_L5 … Training model for up to 360.0s of the
88.39s of remaining time.
        -162.8902       = Validation score   (-mean_absolute_error)
        0.59s     = Training   runtime
        0.0s      = Validation runtime
AutoGluon training complete, total runtime = 1712.25s … Best model:
"WeightedEnsemble_L5"
TabularPredictor saved. To load, use: predictor =
TabularPredictor.load("AutogluonModels/submission_87_A/")
Evaluation: mean_absolute_error on test data: -185.37534710476865
        Note: Scores are always higher_is_better. This metric score can be
multiplied by -1 to get the metric value.
Evaluations on test data:
{
    "mean_absolute_error": -185.37534710476865,
    "root_mean_squared_error": -419.7745198155876,
    "mean_squared_error": -176210.64748640716,
    "r2": 0.8721479365837096,
    "pearsonr": 0.9347973272756952,
    "median_absolute_error": -4.611132812499818
}

Evaluation on test data:
-185.37534710476865
```

[10]:
```
loc = "B"
predictors[1] = fit_predictor_for_location(loc)
```

```
Beginning AutoGluon training … Time limit = 1800s
AutoGluon will save models to "AutogluonModels/submission_87_B/"
AutoGluon Version:  0.8.2
Python Version:     3.10.12
Operating System:   Linux
Platform Machine:   x86_64
Platform Version:   #1 SMP Debian 5.10.197-1 (2023-09-29)
Disk Space Avail:   297.27 GB / 315.93 GB (94.1%)
Train Data Rows:    30768
```

```
Train Data Columns: 46
Label Column: y
Preprocessing data …
AutoGluon infers your prediction problem is: 'regression' (because dtype of
label-column == float and many unique label-values observed).
        Label info (max, min, mean, stddev): (1152.3, -0.0, 97.74541, 195.0957)
        If 'regression' is not the correct problem_type, please manually specify
the problem_type parameter during predictor init (You may specify problem_type
as one of: ['binary', 'multiclass', 'regression'])
Using Feature Generators to preprocess the data …
Fitting AutoMLPipelineFeatureGenerator…
        Available Memory:                    130715.79 MB
        Train Data (Original)  Memory Usage: 12.86 MB (0.0% of available memory)
        Inferring data type of each feature based on column values. Set
feature_metadata_in to manually specify special dtypes of the features.
        Stage 1 Generators:
                Fitting AsTypeFeatureGenerator…
                        Note: Converting 4 features to boolean dtype as they
only contain 2 unique values.
        Stage 2 Generators:
                Fitting FillNaFeatureGenerator…
        Stage 3 Generators:
                Fitting IdentityFeatureGenerator…
        Stage 4 Generators:
                Fitting DropUniqueFeatureGenerator…

Training model for location B…
Train data sample weight sum: 30768
Train data number of rows: 30768
Test data sample weight sum: 2051
Test data number of rows: 2051

        Stage 5 Generators:
                Fitting DropDuplicatesFeatureGenerator…
        Useless Original Features (Count: 3): ['elevation:m', 'sample_weight',
'location']
                These features carry no predictive signal and should be manually
investigated.
                This is typically a feature which has the same value for all
rows.
                These features do not need to be present at inference time.
        Types of features in original data (raw dtype, special dtypes):
                ('float', []) : 42 | ['absolute_humidity_2m:gm3',
'air_density_2m:kgm3', 'ceiling_height_agl:m', 'clear_sky_energy_1h:J',
'clear_sky_rad:W', …]
                ('int', [])   :  1 | ['is_estimated']
        Types of features in processed data (raw dtype, special dtypes):
                ('float', [])     : 39 | ['absolute_humidity_2m:gm3',
'air_density_2m:kgm3', 'ceiling_height_agl:m', 'clear_sky_energy_1h:J',
```

```
'clear_sky_rad:W', …]
                ('int', ['bool']) :  4 | ['is_day:idx', 'is_in_shadow:idx',
'wind_speed_w_1000hPa:ms', 'is_estimated']
        0.2s = Fit runtime
        43 features in original data used to generate 43 features in processed
data.
        Train Data (Processed) Memory Usage: 9.72 MB (0.0% of available memory)
Data preprocessing and feature engineering runtime = 0.19s …
AutoGluon will gauge predictive performance using evaluation metric:
'mean_absolute_error'
        This metric's sign has been flipped to adhere to being higher_is_better.
The metric score can be multiplied by -1 to get the metric value.
        To change this, specify the eval_metric parameter of Predictor()
User-specified model hyperparameters to be fit:
{
        'NN_TORCH': {},
        'GBM': [{'extra_trees': True, 'ag_args': {'name_suffix': 'XT'}}, {},
'GBMLarge'],
        'CAT': {},
        'XGB': {},
        'FASTAI': {},
        'RF': [{'criterion': 'gini', 'ag_args': {'name_suffix': 'Gini',
'problem_types': ['binary', 'multiclass']}}, {'criterion': 'entropy', 'ag_args':
{'name_suffix': 'Entr', 'problem_types': ['binary', 'multiclass']}},
{'criterion': 'squared_error', 'ag_args': {'name_suffix': 'MSE',
'problem_types': ['regression', 'quantile']}}],
        'XT': [{'criterion': 'gini', 'ag_args': {'name_suffix': 'Gini',
'problem_types': ['binary', 'multiclass']}}, {'criterion': 'entropy', 'ag_args':
{'name_suffix': 'Entr', 'problem_types': ['binary', 'multiclass']}},
{'criterion': 'squared_error', 'ag_args': {'name_suffix': 'MSE',
'problem_types': ['regression', 'quantile']}}],
        'KNN': [{'weights': 'uniform', 'ag_args': {'name_suffix': 'Unif'}},
{'weights': 'distance', 'ag_args': {'name_suffix': 'Dist'}}],
}
AutoGluon will fit 4 stack levels (L1 to L4) …
Fitting 11 L1 models …
Fitting model: KNeighborsUnif_BAG_L1 … Training model for up to 599.78s of the
1799.8s of remaining time.
        -57.5698        = Validation score   (-mean_absolute_error)
        0.04s    = Training   runtime
        0.69s    = Validation runtime
Fitting model: KNeighborsDist_BAG_L1 … Training model for up to 598.88s of the
1798.9s of remaining time.
        -57.4932        = Validation score   (-mean_absolute_error)
        0.04s    = Training   runtime
        0.44s    = Validation runtime
Fitting model: LightGBMXT_BAG_L1 … Training model for up to 598.35s of the
1798.37s of remaining time.
```

```
        Fitting 8 child models (S1F1 - S1F8) | Fitting with
ParallelLocalFoldFittingStrategy
        -31.7359        = Validation score   (-mean_absolute_error)
        32.39s   = Training   runtime
        14.1s    = Validation runtime
Fitting model: LightGBM_BAG_L1 … Training model for up to 562.78s of the
1762.8s of remaining time.
        Fitting 8 child models (S1F1 - S1F8) | Fitting with
ParallelLocalFoldFittingStrategy
        -32.3317        = Validation score   (-mean_absolute_error)
        35.42s   = Training   runtime
        16.4s    = Validation runtime
Fitting model: RandomForestMSE_BAG_L1 … Training model for up to 523.27s of
the 1723.29s of remaining time.
        -36.2588        = Validation score   (-mean_absolute_error)
        9.49s    = Training   runtime
        1.17s    = Validation runtime
Fitting model: CatBoost_BAG_L1 … Training model for up to 512.11s of the
1712.12s of remaining time.
        Fitting 8 child models (S1F1 - S1F8) | Fitting with
ParallelLocalFoldFittingStrategy
        -34.1753        = Validation score   (-mean_absolute_error)
        200.62s  = Training   runtime
        0.09s    = Validation runtime
Fitting model: ExtraTreesMSE_BAG_L1 … Training model for up to 310.29s of the
1510.3s of remaining time.
        -37.0616        = Validation score   (-mean_absolute_error)
        1.93s    = Training   runtime
        1.19s    = Validation runtime
Fitting model: NeuralNetFastAI_BAG_L1 … Training model for up to 306.6s of the
1506.62s of remaining time.
        Fitting 8 child models (S1F1 - S1F8) | Fitting with
ParallelLocalFoldFittingStrategy
        -40.1174        = Validation score   (-mean_absolute_error)
        37.62s   = Training   runtime
        0.55s    = Validation runtime
Fitting model: XGBoost_BAG_L1 … Training model for up to 267.79s of the
1467.81s of remaining time.
        Fitting 8 child models (S1F1 - S1F8) | Fitting with
ParallelLocalFoldFittingStrategy
        -34.8872        = Validation score   (-mean_absolute_error)
        96.88s   = Training   runtime
        23.39s   = Validation runtime
Fitting model: NeuralNetTorch_BAG_L1 … Training model for up to 166.88s of the
1366.9s of remaining time.
        Fitting 8 child models (S1F1 - S1F8) | Fitting with
ParallelLocalFoldFittingStrategy
        -33.3318        = Validation score   (-mean_absolute_error)
```

```
        134.38s  = Training   runtime
        0.37s    = Validation runtime
Fitting model: LightGBMLarge_BAG_L1 … Training model for up to 31.17s of the
1231.19s of remaining time.
        Fitting 8 child models (S1F1 - S1F8) | Fitting with
ParallelLocalFoldFittingStrategy
        -31.1206         = Validation score   (-mean_absolute_error)
        26.79s   = Training   runtime
        4.39s    = Validation runtime
Completed 1/20 k-fold bagging repeats …
Fitting model: WeightedEnsemble_L2 … Training model for up to 360.0s of the
1201.76s of remaining time.
        -30.2352         = Validation score   (-mean_absolute_error)
        0.73s    = Training   runtime
        0.0s     = Validation runtime
Fitting 9 L2 models …
Fitting model: LightGBMXT_BAG_L2 … Training model for up to 533.65s of the
1200.99s of remaining time.
        Fitting 8 child models (S1F1 - S1F8) | Fitting with
ParallelLocalFoldFittingStrategy
        -28.1734         = Validation score   (-mean_absolute_error)
        3.8s     = Training   runtime
        0.29s    = Validation runtime
Fitting model: LightGBM_BAG_L2 … Training model for up to 528.55s of the
1195.9s of remaining time.
        Fitting 8 child models (S1F1 - S1F8) | Fitting with
ParallelLocalFoldFittingStrategy
        -27.8504         = Validation score   (-mean_absolute_error)
        2.55s    = Training   runtime
        0.12s    = Validation runtime
Fitting model: RandomForestMSE_BAG_L2 … Training model for up to 524.82s of
the 1192.17s of remaining time.
        -26.8497         = Validation score   (-mean_absolute_error)
        13.74s   = Training   runtime
        1.21s    = Validation runtime
Fitting model: CatBoost_BAG_L2 … Training model for up to 509.34s of the
1176.69s of remaining time.
        Fitting 8 child models (S1F1 - S1F8) | Fitting with
ParallelLocalFoldFittingStrategy
        -27.9982         = Validation score   (-mean_absolute_error)
        13.44s   = Training   runtime
        0.04s    = Validation runtime
Fitting model: ExtraTreesMSE_BAG_L2 … Training model for up to 494.74s of the
1162.09s of remaining time.
        -27.1079         = Validation score   (-mean_absolute_error)
        2.33s    = Training   runtime
        1.23s    = Validation runtime
Fitting model: NeuralNetFastAI_BAG_L2 … Training model for up to 490.62s of
```

```
the 1157.97s of remaining time.
        Fitting 8 child models (S1F1 - S1F8) | Fitting with
ParallelLocalFoldFittingStrategy
        -27.3403        = Validation score   (-mean_absolute_error)
        37.93s   = Training   runtime
        0.51s    = Validation runtime
Fitting model: XGBoost_BAG_L2 … Training model for up to 451.46s of the
1118.81s of remaining time.
        Fitting 8 child models (S1F1 - S1F8) | Fitting with
ParallelLocalFoldFittingStrategy
        -27.5295        = Validation score   (-mean_absolute_error)
        2.93s    = Training   runtime
        0.13s    = Validation runtime
Fitting model: NeuralNetTorch_BAG_L2 … Training model for up to 447.19s of the
1114.54s of remaining time.
        Fitting 8 child models (S1F1 - S1F8) | Fitting with
ParallelLocalFoldFittingStrategy
        -27.2628        = Validation score   (-mean_absolute_error)
        87.88s   = Training   runtime
        0.55s    = Validation runtime
Fitting model: LightGBMLarge_BAG_L2 … Training model for up to 358.06s of the
1025.41s of remaining time.
        Fitting 8 child models (S1F1 - S1F8) | Fitting with
ParallelLocalFoldFittingStrategy
        -27.1834        = Validation score   (-mean_absolute_error)
        69.59s   = Training   runtime
        1.89s    = Validation runtime
Completed 1/20 k-fold bagging repeats …
Fitting model: WeightedEnsemble_L3 … Training model for up to 360.0s of the
951.37s of remaining time.
        -26.3746        = Validation score   (-mean_absolute_error)
        0.58s    = Training   runtime
        0.0s     = Validation runtime
Fitting 9 L3 models …
Fitting model: LightGBMXT_BAG_L3 … Training model for up to 633.69s of the
950.76s of remaining time.
        Fitting 8 child models (S1F1 - S1F8) | Fitting with
ParallelLocalFoldFittingStrategy
        -27.2481        = Validation score   (-mean_absolute_error)
        1.84s    = Training   runtime
        0.11s    = Validation runtime
Fitting model: LightGBM_BAG_L3 … Training model for up to 630.63s of the
947.7s of remaining time.
        Fitting 8 child models (S1F1 - S1F8) | Fitting with
ParallelLocalFoldFittingStrategy
        -27.043  = Validation score   (-mean_absolute_error)
        1.85s    = Training   runtime
        0.08s    = Validation runtime
```

```
Fitting model: RandomForestMSE_BAG_L3 … Training model for up to 627.31s of
the 944.38s of remaining time.
        -26.703  = Validation score   (-mean_absolute_error)
        13.83s   = Training   runtime
        1.22s    = Validation runtime
Fitting model: CatBoost_BAG_L3 … Training model for up to 611.74s of the
928.81s of remaining time.
        Fitting 8 child models (S1F1 - S1F8) | Fitting with
ParallelLocalFoldFittingStrategy
        -27.058  = Validation score   (-mean_absolute_error)
        3.69s    = Training   runtime
        0.04s    = Validation runtime
Fitting model: ExtraTreesMSE_BAG_L3 … Training model for up to 606.85s of the
923.92s of remaining time.
        -26.6627         = Validation score   (-mean_absolute_error)
        2.37s    = Training   runtime
        1.23s    = Validation runtime
Fitting model: NeuralNetFastAI_BAG_L3 … Training model for up to 602.7s of the
919.77s of remaining time.
        Fitting 8 child models (S1F1 - S1F8) | Fitting with
ParallelLocalFoldFittingStrategy
        -26.8083         = Validation score   (-mean_absolute_error)
        37.97s   = Training   runtime
        0.49s    = Validation runtime
Fitting model: XGBoost_BAG_L3 … Training model for up to 563.48s of the
880.55s of remaining time.
        Fitting 8 child models (S1F1 - S1F8) | Fitting with
ParallelLocalFoldFittingStrategy
        -26.8029         = Validation score   (-mean_absolute_error)
        2.51s    = Training   runtime
        0.11s    = Validation runtime
Fitting model: NeuralNetTorch_BAG_L3 … Training model for up to 559.56s of the
876.63s of remaining time.
        Fitting 8 child models (S1F1 - S1F8) | Fitting with
ParallelLocalFoldFittingStrategy
        -26.4539         = Validation score   (-mean_absolute_error)
        41.17s   = Training   runtime
        0.51s    = Validation runtime
Fitting model: LightGBMLarge_BAG_L3 … Training model for up to 517.07s of the
834.14s of remaining time.
        Fitting 8 child models (S1F1 - S1F8) | Fitting with
ParallelLocalFoldFittingStrategy
        -26.8632         = Validation score   (-mean_absolute_error)
        6.78s    = Training   runtime
        0.23s    = Validation runtime
Repeating k-fold bagging: 2/20
Fitting model: LightGBMXT_BAG_L3 … Training model for up to 508.91s of the
825.98s of remaining time.
```

```
        Fitting 8 child models (S2F1 - S2F8) | Fitting with
ParallelLocalFoldFittingStrategy
        -27.1968        = Validation score   (-mean_absolute_error)
        3.77s    = Training   runtime
        0.2s     = Validation runtime
Fitting model: LightGBM_BAG_L3 … Training model for up to 505.81s of the
822.88s of remaining time.
        Fitting 8 child models (S2F1 - S2F8) | Fitting with
ParallelLocalFoldFittingStrategy
        -26.9302        = Validation score   (-mean_absolute_error)
        3.88s    = Training   runtime
        0.17s    = Validation runtime
Fitting model: CatBoost_BAG_L3 … Training model for up to 502.6s of the
819.66s of remaining time.
        Fitting 8 child models (S2F1 - S2F8) | Fitting with
ParallelLocalFoldFittingStrategy
        -26.9896        = Validation score   (-mean_absolute_error)
        7.6s     = Training   runtime
        0.07s    = Validation runtime
Fitting model: NeuralNetFastAI_BAG_L3 … Training model for up to 497.33s of
the 814.4s of remaining time.
        Fitting 8 child models (S2F1 - S2F8) | Fitting with
ParallelLocalFoldFittingStrategy
        -26.6248        = Validation score   (-mean_absolute_error)
        75.62s   = Training   runtime
        0.97s    = Validation runtime
Fitting model: XGBoost_BAG_L3 … Training model for up to 458.38s of the
775.45s of remaining time.
        Fitting 8 child models (S2F1 - S2F8) | Fitting with
ParallelLocalFoldFittingStrategy
        -26.7098        = Validation score   (-mean_absolute_error)
        5.05s    = Training   runtime
        0.22s    = Validation runtime
Fitting model: NeuralNetTorch_BAG_L3 … Training model for up to 454.42s of the
771.49s of remaining time.
        Fitting 8 child models (S2F1 - S2F8) | Fitting with
ParallelLocalFoldFittingStrategy
        -26.3034        = Validation score   (-mean_absolute_error)
        83.18s   = Training   runtime
        1.01s    = Validation runtime
Fitting model: LightGBMLarge_BAG_L3 … Training model for up to 411.1s of the
728.17s of remaining time.
        Fitting 8 child models (S2F1 - S2F8) | Fitting with
ParallelLocalFoldFittingStrategy
        -26.7552        = Validation score   (-mean_absolute_error)
        12.75s   = Training   runtime
        0.43s    = Validation runtime
Repeating k-fold bagging: 3/20
```

```
Fitting model: LightGBMXT_BAG_L3 … Training model for up to 403.91s of the
720.98s of remaining time.
        Fitting 8 child models (S3F1 - S3F8) | Fitting with
ParallelLocalFoldFittingStrategy
        -27.146  = Validation score   (-mean_absolute_error)
        5.76s    = Training   runtime
        0.31s    = Validation runtime
Fitting model: LightGBM_BAG_L3 … Training model for up to 400.66s of the
717.73s of remaining time.
        Fitting 8 child models (S3F1 - S3F8) | Fitting with
ParallelLocalFoldFittingStrategy
        -26.8696         = Validation score   (-mean_absolute_error)
        5.82s    = Training   runtime
        0.25s    = Validation runtime
Fitting model: CatBoost_BAG_L3 … Training model for up to 397.5s of the
714.57s of remaining time.
        Fitting 8 child models (S3F1 - S3F8) | Fitting with
ParallelLocalFoldFittingStrategy
        -26.9509         = Validation score   (-mean_absolute_error)
        11.99s   = Training   runtime
        0.1s     = Validation runtime
Fitting model: NeuralNetFastAI_BAG_L3 … Training model for up to 391.95s of
the 709.01s of remaining time.
        Fitting 8 child models (S3F1 - S3F8) | Fitting with
ParallelLocalFoldFittingStrategy
        -26.5301         = Validation score   (-mean_absolute_error)
        113.58s  = Training   runtime
        1.49s    = Validation runtime
Fitting model: XGBoost_BAG_L3 … Training model for up to 352.6s of the 669.66s
of remaining time.
        Fitting 8 child models (S3F1 - S3F8) | Fitting with
ParallelLocalFoldFittingStrategy
        -26.6585         = Validation score   (-mean_absolute_error)
        7.85s    = Training   runtime
        0.34s    = Validation runtime
Fitting model: NeuralNetTorch_BAG_L3 … Training model for up to 348.57s of the
665.64s of remaining time.
        Fitting 8 child models (S3F1 - S3F8) | Fitting with
ParallelLocalFoldFittingStrategy
        -26.2363         = Validation score   (-mean_absolute_error)
        133.16s  = Training   runtime
        1.57s    = Validation runtime
Fitting model: LightGBMLarge_BAG_L3 … Training model for up to 297.22s of the
614.29s of remaining time.
        Fitting 8 child models (S3F1 - S3F8) | Fitting with
ParallelLocalFoldFittingStrategy
        -26.6486         = Validation score   (-mean_absolute_error)
        19.14s   = Training   runtime
```

```
        0.66s    = Validation runtime
Repeating k-fold bagging: 4/20
Fitting model: LightGBMXT_BAG_L3 … Training model for up to 289.57s of the
606.64s of remaining time.
        Fitting 8 child models (S4F1 - S4F8) | Fitting with
ParallelLocalFoldFittingStrategy
        -27.124  = Validation score   (-mean_absolute_error)
        7.66s    = Training   runtime
        0.41s    = Validation runtime
Fitting model: LightGBM_BAG_L3 … Training model for up to 286.47s of the
603.54s of remaining time.
        Fitting 8 child models (S4F1 - S4F8) | Fitting with
ParallelLocalFoldFittingStrategy
        -26.8502         = Validation score   (-mean_absolute_error)
        7.65s    = Training   runtime
        0.32s    = Validation runtime
Fitting model: CatBoost_BAG_L3 … Training model for up to 283.36s of the
600.43s of remaining time.
        Fitting 8 child models (S4F1 - S4F8) | Fitting with
ParallelLocalFoldFittingStrategy
        -26.9393         = Validation score   (-mean_absolute_error)
        17.06s   = Training   runtime
        0.14s    = Validation runtime
Fitting model: NeuralNetFastAI_BAG_L3 … Training model for up to 276.99s of
the 594.06s of remaining time.
        Fitting 8 child models (S4F1 - S4F8) | Fitting with
ParallelLocalFoldFittingStrategy
        -26.4943         = Validation score   (-mean_absolute_error)
        151.43s  = Training   runtime
        2.01s    = Validation runtime
Fitting model: XGBoost_BAG_L3 … Training model for up to 237.89s of the
554.96s of remaining time.
        Fitting 8 child models (S4F1 - S4F8) | Fitting with
ParallelLocalFoldFittingStrategy
        -26.6357         = Validation score   (-mean_absolute_error)
        10.64s   = Training   runtime
        0.46s    = Validation runtime
Fitting model: NeuralNetTorch_BAG_L3 … Training model for up to 233.89s of the
550.96s of remaining time.
        Fitting 8 child models (S4F1 - S4F8) | Fitting with
ParallelLocalFoldFittingStrategy
        -26.2153         = Validation score   (-mean_absolute_error)
        178.36s  = Training   runtime
        2.06s    = Validation runtime
Fitting model: LightGBMLarge_BAG_L3 … Training model for up to 187.32s of the
504.39s of remaining time.
        Fitting 8 child models (S4F1 - S4F8) | Fitting with
ParallelLocalFoldFittingStrategy
```

```
        -26.6029        = Validation score   (-mean_absolute_error)
        29.14s   = Training   runtime
        0.99s    = Validation runtime
Repeating k-fold bagging: 5/20
Fitting model: LightGBMXT_BAG_L3 … Training model for up to 175.93s of the
493.0s of remaining time.
        Fitting 8 child models (S5F1 - S5F8) | Fitting with
ParallelLocalFoldFittingStrategy
        -27.1196        = Validation score   (-mean_absolute_error)
        9.48s    = Training   runtime
        0.52s    = Validation runtime
Fitting model: LightGBM_BAG_L3 … Training model for up to 172.8s of the
489.87s of remaining time.
        Fitting 8 child models (S5F1 - S5F8) | Fitting with
ParallelLocalFoldFittingStrategy
        -26.8503        = Validation score   (-mean_absolute_error)
        9.45s    = Training   runtime
        0.41s    = Validation runtime
Fitting model: CatBoost_BAG_L3 … Training model for up to 169.78s of the
486.84s of remaining time.
        Fitting 8 child models (S5F1 - S5F8) | Fitting with
ParallelLocalFoldFittingStrategy
        -26.9404        = Validation score   (-mean_absolute_error)
        21.13s   = Training   runtime
        0.18s    = Validation runtime
Fitting model: NeuralNetFastAI_BAG_L3 … Training model for up to 164.52s of
the 481.59s of remaining time.
        Fitting 8 child models (S5F1 - S5F8) | Fitting with
ParallelLocalFoldFittingStrategy
        -26.4822        = Validation score   (-mean_absolute_error)
        188.89s  = Training   runtime
        2.53s    = Validation runtime
Fitting model: XGBoost_BAG_L3 … Training model for up to 125.69s of the
442.76s of remaining time.
        Fitting 8 child models (S5F1 - S5F8) | Fitting with
ParallelLocalFoldFittingStrategy
        -26.6484        = Validation score   (-mean_absolute_error)
        13.25s   = Training   runtime
        0.57s    = Validation runtime
Fitting model: NeuralNetTorch_BAG_L3 … Training model for up to 121.58s of the
438.64s of remaining time.
        Fitting 8 child models (S5F1 - S5F8) | Fitting with
ParallelLocalFoldFittingStrategy
        -26.2068        = Validation score   (-mean_absolute_error)
        225.82s  = Training   runtime
        2.6s     = Validation runtime
Fitting model: LightGBMLarge_BAG_L3 … Training model for up to 72.84s of the
389.91s of remaining time.
```

```
        Fitting 8 child models (S5F1 - S5F8) | Fitting with
ParallelLocalFoldFittingStrategy
        -26.5967        = Validation score   (-mean_absolute_error)
        39.47s   = Training   runtime
        1.34s    = Validation runtime
Completed 5/20 k-fold bagging repeats …
Fitting model: WeightedEnsemble_L4 … Training model for up to 360.0s of the
378.16s of remaining time.
        -26.0293        = Validation score   (-mean_absolute_error)
        0.59s    = Training   runtime
        0.0s     = Validation runtime
Fitting 9 L4 models …
Fitting model: LightGBMXT_BAG_L4 … Training model for up to 377.55s of the
377.53s of remaining time.
        Fitting 8 child models (S1F1 - S1F8) | Fitting with
ParallelLocalFoldFittingStrategy
        -27.1533        = Validation score   (-mean_absolute_error)
        1.83s    = Training   runtime
        0.09s    = Validation runtime
Fitting model: LightGBM_BAG_L4 … Training model for up to 374.54s of the
374.53s of remaining time.
        Fitting 8 child models (S1F1 - S1F8) | Fitting with
ParallelLocalFoldFittingStrategy
        -26.9643        = Validation score   (-mean_absolute_error)
        1.86s    = Training   runtime
        0.08s    = Validation runtime
Fitting model: RandomForestMSE_BAG_L4 … Training model for up to 371.25s of
the 371.24s of remaining time.
        -26.644  = Validation score   (-mean_absolute_error)
        13.86s   = Training   runtime
        1.23s    = Validation runtime
Fitting model: CatBoost_BAG_L4 … Training model for up to 355.63s of the
355.62s of remaining time.
        Fitting 8 child models (S1F1 - S1F8) | Fitting with
ParallelLocalFoldFittingStrategy
        -26.8457        = Validation score   (-mean_absolute_error)
        3.74s    = Training   runtime
        0.04s    = Validation runtime
Fitting model: ExtraTreesMSE_BAG_L4 … Training model for up to 350.71s of the
350.7s of remaining time.
        -26.7369        = Validation score   (-mean_absolute_error)
        2.4s     = Training   runtime
        1.24s    = Validation runtime
Fitting model: NeuralNetFastAI_BAG_L4 … Training model for up to 346.52s of
the 346.51s of remaining time.
        Fitting 8 child models (S1F1 - S1F8) | Fitting with
ParallelLocalFoldFittingStrategy
        -26.7182        = Validation score   (-mean_absolute_error)
```

```
        38.22s   = Training   runtime
        0.48s    = Validation runtime
Fitting model: XGBoost_BAG_L4 … Training model for up to 306.98s of the
306.97s of remaining time.
        Fitting 8 child models (S1F1 - S1F8) | Fitting with
ParallelLocalFoldFittingStrategy
        -26.8683         = Validation score   (-mean_absolute_error)
        2.45s    = Training   runtime
        0.1s     = Validation runtime
Fitting model: NeuralNetTorch_BAG_L4 … Training model for up to 303.12s of the
303.11s of remaining time.
        Fitting 8 child models (S1F1 - S1F8) | Fitting with
ParallelLocalFoldFittingStrategy
        -26.3698         = Validation score   (-mean_absolute_error)
        42.79s   = Training   runtime
        0.55s    = Validation runtime
Fitting model: LightGBMLarge_BAG_L4 … Training model for up to 258.96s of the
258.95s of remaining time.
        Fitting 8 child models (S1F1 - S1F8) | Fitting with
ParallelLocalFoldFittingStrategy
        -26.8522         = Validation score   (-mean_absolute_error)
        5.66s    = Training   runtime
        0.19s    = Validation runtime
Repeating k-fold bagging: 2/20
Fitting model: LightGBMXT_BAG_L4 … Training model for up to 252.01s of the
252.0s of remaining time.
        Fitting 8 child models (S2F1 - S2F8) | Fitting with
ParallelLocalFoldFittingStrategy
        -27.0795         = Validation score   (-mean_absolute_error)
        3.62s    = Training   runtime
        0.18s    = Validation runtime
Fitting model: LightGBM_BAG_L4 … Training model for up to 248.94s of the
248.93s of remaining time.
        Fitting 8 child models (S2F1 - S2F8) | Fitting with
ParallelLocalFoldFittingStrategy
        -26.7872         = Validation score   (-mean_absolute_error)
        3.99s    = Training   runtime
        0.17s    = Validation runtime
Fitting model: CatBoost_BAG_L4 … Training model for up to 245.61s of the
245.6s of remaining time.
        Fitting 8 child models (S2F1 - S2F8) | Fitting with
ParallelLocalFoldFittingStrategy
        -26.7903         = Validation score   (-mean_absolute_error)
        7.68s    = Training   runtime
        0.08s    = Validation runtime
Fitting model: NeuralNetFastAI_BAG_L4 … Training model for up to 240.36s of
the 240.35s of remaining time.
        Fitting 8 child models (S2F1 - S2F8) | Fitting with
```

```
ParallelLocalFoldFittingStrategy
        -26.5807        = Validation score   (-mean_absolute_error)
        76.27s   = Training   runtime
        0.97s    = Validation runtime
Fitting model: XGBoost_BAG_L4 … Training model for up to 200.9s of the 200.89s
of remaining time.
        Fitting 8 child models (S2F1 - S2F8) | Fitting with
ParallelLocalFoldFittingStrategy
        -26.7375        = Validation score   (-mean_absolute_error)
        4.93s    = Training   runtime
        0.21s    = Validation runtime
Fitting model: NeuralNetTorch_BAG_L4 … Training model for up to 197.16s of the
197.15s of remaining time.
        Fitting 8 child models (S2F1 - S2F8) | Fitting with
ParallelLocalFoldFittingStrategy
        -26.2279        = Validation score   (-mean_absolute_error)
        86.0s    = Training   runtime
        1.11s    = Validation runtime
Fitting model: LightGBMLarge_BAG_L4 … Training model for up to 152.69s of the
152.67s of remaining time.
        Fitting 8 child models (S2F1 - S2F8) | Fitting with
ParallelLocalFoldFittingStrategy
        -26.7166        = Validation score   (-mean_absolute_error)
        12.87s   = Training   runtime
        0.42s    = Validation runtime
Completed 2/20 k-fold bagging repeats …
Fitting model: WeightedEnsemble_L5 … Training model for up to 360.0s of the
144.1s of remaining time.
        -26.0379        = Validation score   (-mean_absolute_error)
        0.58s    = Training   runtime
        0.0s     = Validation runtime
AutoGluon training complete, total runtime = 1656.52s … Best model:
"WeightedEnsemble_L4"
TabularPredictor saved. To load, use: predictor =
TabularPredictor.load("AutogluonModels/submission_87_B/")
Evaluation: mean_absolute_error on test data: -36.63727279472588
        Note: Scores are always higher_is_better. This metric score can be
multiplied by -1 to get the metric value.
Evaluations on test data:
{
    "mean_absolute_error": -36.63727279472588,
    "root_mean_squared_error": -88.72453645593494,
    "mean_squared_error": -7872.043369320529,
    "r2": 0.7468117405489736,
    "pearsonr": 0.8845040251968049,
    "median_absolute_error": -2.942364014375795
}
```

```
Evaluation on test data:
-36.63727279472588
```

[11]:
```
loc = "C"
predictors[2] = fit_predictor_for_location(loc)
```

```
Beginning AutoGluon training … Time limit = 1800s
AutoGluon will save models to "AutogluonModels/submission_87_C/"
AutoGluon Version:  0.8.2
Python Version:     3.10.12
Operating System:   Linux
Platform Machine:   x86_64
Platform Version:   #1 SMP Debian 5.10.197-1 (2023-09-29)
Disk Space Avail:   292.77 GB / 315.93 GB (92.7%)
Train Data Rows:    24492
Train Data Columns: 46
Label Column: y
Preprocessing data …
AutoGluon infers your prediction problem is: 'regression' (because dtype of
label-column == float and label-values can't be converted to int).
        Label info (max, min, mean, stddev): (999.6, 0.0, 78.11911, 167.50151)
        If 'regression' is not the correct problem_type, please manually specify
the problem_type parameter during predictor init (You may specify problem_type
as one of: ['binary', 'multiclass', 'regression'])
Using Feature Generators to preprocess the data …
Fitting AutoMLPipelineFeatureGenerator…
        Available Memory:                    127685.07 MB
        Train Data (Original)  Memory Usage: 10.24 MB (0.0% of available memory)
        Inferring data type of each feature based on column values. Set
feature_metadata_in to manually specify special dtypes of the features.
        Stage 1 Generators:
                Fitting AsTypeFeatureGenerator…
                        Note: Converting 3 features to boolean dtype as they
only contain 2 unique values.
        Stage 2 Generators:
                Fitting FillNaFeatureGenerator…
        Stage 3 Generators:
                Fitting IdentityFeatureGenerator…
        Stage 4 Generators:
                Fitting DropUniqueFeatureGenerator…
        Stage 5 Generators:
                Fitting DropDuplicatesFeatureGenerator…
        Useless Original Features (Count: 3): ['elevation:m', 'sample_weight',
'location']
                These features carry no predictive signal and should be manually
investigated.
                This is typically a feature which has the same value for all
rows.
```

```
                These features do not need to be present at inference time.
        Types of features in original data (raw dtype, special dtypes):
                ('float', []) : 42 | ['absolute_humidity_2m:gm3',
'air_density_2m:kgm3', 'ceiling_height_agl:m', 'clear_sky_energy_1h:J',
'clear_sky_rad:W', …]
                ('int', [])   :  1 | ['is_estimated']
        Types of features in processed data (raw dtype, special dtypes):

Training model for location C…
Train data sample weight sum: 24492
Train data number of rows: 24492
Test data sample weight sum: 1579
Test data number of rows: 1579

                ('float', [])     : 40 | ['absolute_humidity_2m:gm3',
'air_density_2m:kgm3', 'ceiling_height_agl:m', 'clear_sky_energy_1h:J',
'clear_sky_rad:W', …]
                ('int', ['bool']) :  3 | ['is_day:idx', 'is_in_shadow:idx',
'is_estimated']
        0.1s = Fit runtime
        43 features in original data used to generate 43 features in processed
data.
        Train Data (Processed) Memory Usage: 7.91 MB (0.0% of available memory)
Data preprocessing and feature engineering runtime = 0.16s …
AutoGluon will gauge predictive performance using evaluation metric:
'mean_absolute_error'
        This metric's sign has been flipped to adhere to being higher_is_better.
The metric score can be multiplied by -1 to get the metric value.
        To change this, specify the eval_metric parameter of Predictor()
User-specified model hyperparameters to be fit:
{
        'NN_TORCH': {},
        'GBM': [{'extra_trees': True, 'ag_args': {'name_suffix': 'XT'}}, {},
'GBMLarge'],
        'CAT': {},
        'XGB': {},
        'FASTAI': {},
        'RF': [{'criterion': 'gini', 'ag_args': {'name_suffix': 'Gini',
'problem_types': ['binary', 'multiclass']}}, {'criterion': 'entropy', 'ag_args':
{'name_suffix': 'Entr', 'problem_types': ['binary', 'multiclass']}},
{'criterion': 'squared_error', 'ag_args': {'name_suffix': 'MSE',
'problem_types': ['regression', 'quantile']}}],
        'XT': [{'criterion': 'gini', 'ag_args': {'name_suffix': 'Gini',
'problem_types': ['binary', 'multiclass']}}, {'criterion': 'entropy', 'ag_args':
{'name_suffix': 'Entr', 'problem_types': ['binary', 'multiclass']}},
{'criterion': 'squared_error', 'ag_args': {'name_suffix': 'MSE',
'problem_types': ['regression', 'quantile']}}],
        'KNN': [{'weights': 'uniform', 'ag_args': {'name_suffix': 'Unif'}},
{'weights': 'distance', 'ag_args': {'name_suffix': 'Dist'}}],
```

```
}
AutoGluon will fit 4 stack levels (L1 to L4) …
Fitting 11 L1 models …
Fitting model: KNeighborsUnif_BAG_L1 … Training model for up to 599.8s of the
1799.84s of remaining time.
        -32.6988         = Validation score   (-mean_absolute_error)
        0.03s    = Training   runtime
        0.29s    = Validation runtime
Fitting model: KNeighborsDist_BAG_L1 … Training model for up to 599.43s of the
1799.47s of remaining time.
        -32.7258         = Validation score   (-mean_absolute_error)
        0.03s    = Training   runtime
        0.29s    = Validation runtime
Fitting model: LightGBMXT_BAG_L1 … Training model for up to 599.06s of the
1799.1s of remaining time.
        Fitting 8 child models (S1F1 - S1F8) | Fitting with
ParallelLocalFoldFittingStrategy
        -18.553  = Validation score   (-mean_absolute_error)
        29.06s   = Training   runtime
        13.33s   = Validation runtime
Fitting model: LightGBM_BAG_L1 … Training model for up to 566.73s of the
1766.77s of remaining time.
        Fitting 8 child models (S1F1 - S1F8) | Fitting with
ParallelLocalFoldFittingStrategy
        -19.3784         = Validation score   (-mean_absolute_error)
        31.54s   = Training   runtime
        9.92s    = Validation runtime
Fitting model: RandomForestMSE_BAG_L1 … Training model for up to 532.37s of
the 1732.41s of remaining time.
        -20.7654         = Validation score   (-mean_absolute_error)
        5.18s    = Training   runtime
        0.76s    = Validation runtime
Fitting model: CatBoost_BAG_L1 … Training model for up to 526.12s of the
1726.16s of remaining time.
        Fitting 8 child models (S1F1 - S1F8) | Fitting with
ParallelLocalFoldFittingStrategy
        -19.7462         = Validation score   (-mean_absolute_error)
        197.53s  = Training   runtime
        0.08s    = Validation runtime
Fitting model: ExtraTreesMSE_BAG_L1 … Training model for up to 327.41s of the
1527.45s of remaining time.
        -20.7137         = Validation score   (-mean_absolute_error)
        1.14s    = Training   runtime
        0.82s    = Validation runtime
Fitting model: NeuralNetFastAI_BAG_L1 … Training model for up to 325.11s of
the 1525.15s of remaining time.
        Fitting 8 child models (S1F1 - S1F8) | Fitting with
ParallelLocalFoldFittingStrategy
```

```
        -21.079  = Validation score   (-mean_absolute_error)
        29.82s   = Training   runtime
        0.42s    = Validation runtime
Fitting model: XGBoost_BAG_L1 … Training model for up to 294.03s of the
1494.07s of remaining time.
        Fitting 8 child models (S1F1 - S1F8) | Fitting with
ParallelLocalFoldFittingStrategy
        -20.2144         = Validation score   (-mean_absolute_error)
        55.29s   = Training   runtime
        3.21s    = Validation runtime
Fitting model: NeuralNetTorch_BAG_L1 … Training model for up to 236.35s of the
1436.39s of remaining time.
        Fitting 8 child models (S1F1 - S1F8) | Fitting with
ParallelLocalFoldFittingStrategy
        -19.3858         = Validation score   (-mean_absolute_error)
        85.79s   = Training   runtime
        0.35s    = Validation runtime
Fitting model: LightGBMLarge_BAG_L1 … Training model for up to 149.36s of the
1349.4s of remaining time.
        Fitting 8 child models (S1F1 - S1F8) | Fitting with
ParallelLocalFoldFittingStrategy
        -18.9081         = Validation score   (-mean_absolute_error)
        100.4s   = Training   runtime
        20.43s   = Validation runtime
Completed 1/20 k-fold bagging repeats …
Fitting model: WeightedEnsemble_L2 … Training model for up to 360.0s of the
1243.68s of remaining time.
        -17.7931         = Validation score   (-mean_absolute_error)
        0.62s    = Training   runtime
        0.0s     = Validation runtime
Fitting 9 L2 models …
Fitting model: LightGBMXT_BAG_L2 … Training model for up to 552.32s of the
1243.02s of remaining time.
        Fitting 8 child models (S1F1 - S1F8) | Fitting with
ParallelLocalFoldFittingStrategy
        -18.3862         = Validation score   (-mean_absolute_error)
        2.46s    = Training   runtime
        0.12s    = Validation runtime
Fitting model: LightGBM_BAG_L2 … Training model for up to 548.67s of the
1239.37s of remaining time.
        Fitting 8 child models (S1F1 - S1F8) | Fitting with
ParallelLocalFoldFittingStrategy
        -18.2307         = Validation score   (-mean_absolute_error)
        2.09s    = Training   runtime
        0.07s    = Validation runtime
Fitting model: RandomForestMSE_BAG_L2 … Training model for up to 545.24s of
the 1235.94s of remaining time.
        -17.9102         = Validation score   (-mean_absolute_error)
```

```
        9.23s    = Training   runtime
        0.83s    = Validation runtime
Fitting model: CatBoost_BAG_L2 … Training model for up to 534.86s of the
1225.57s of remaining time.
        Fitting 8 child models (S1F1 - S1F8) | Fitting with
ParallelLocalFoldFittingStrategy
        -18.3757         = Validation score   (-mean_absolute_error)
        5.67s    = Training   runtime
        0.04s    = Validation runtime
Fitting model: ExtraTreesMSE_BAG_L2 … Training model for up to 528.04s of the
1218.74s of remaining time.
        -17.8801         = Validation score   (-mean_absolute_error)
        1.5s     = Training   runtime
        0.84s    = Validation runtime
Fitting model: NeuralNetFastAI_BAG_L2 … Training model for up to 525.35s of
the 1216.06s of remaining time.
        Fitting 8 child models (S1F1 - S1F8) | Fitting with
ParallelLocalFoldFittingStrategy
        -17.9889         = Validation score   (-mean_absolute_error)
        29.89s   = Training   runtime
        0.38s    = Validation runtime
Fitting model: XGBoost_BAG_L2 … Training model for up to 494.16s of the
1184.86s of remaining time.
        Fitting 8 child models (S1F1 - S1F8) | Fitting with
ParallelLocalFoldFittingStrategy
        -18.0582         = Validation score   (-mean_absolute_error)
        2.88s    = Training   runtime
        0.09s    = Validation runtime
Fitting model: NeuralNetTorch_BAG_L2 … Training model for up to 489.89s of the
1180.59s of remaining time.
        Fitting 8 child models (S1F1 - S1F8) | Fitting with
ParallelLocalFoldFittingStrategy
        -18.0861         = Validation score   (-mean_absolute_error)
        35.42s   = Training   runtime
        0.48s    = Validation runtime
Fitting model: LightGBMLarge_BAG_L2 … Training model for up to 453.05s of the
1143.75s of remaining time.
        Fitting 8 child models (S1F1 - S1F8) | Fitting with
ParallelLocalFoldFittingStrategy
        -18.3122         = Validation score   (-mean_absolute_error)
        6.37s    = Training   runtime
        0.18s    = Validation runtime
Repeating k-fold bagging: 2/20
Fitting model: LightGBMXT_BAG_L2 … Training model for up to 445.35s of the
1136.05s of remaining time.
        Fitting 8 child models (S2F1 - S2F8) | Fitting with
ParallelLocalFoldFittingStrategy
        -18.2281         = Validation score   (-mean_absolute_error)
```

```
        4.5s     = Training   runtime
        0.23s    = Validation runtime
Fitting model: LightGBM_BAG_L2 … Training model for up to 442.03s of the
1132.73s of remaining time.
        Fitting 8 child models (S2F1 - S2F8) | Fitting with
ParallelLocalFoldFittingStrategy
        -18.0676         = Validation score   (-mean_absolute_error)
        4.07s    = Training   runtime
        0.14s    = Validation runtime
Fitting model: CatBoost_BAG_L2 … Training model for up to 438.89s of the
1129.59s of remaining time.
        Fitting 8 child models (S2F1 - S2F8) | Fitting with
ParallelLocalFoldFittingStrategy
        -18.2567         = Validation score   (-mean_absolute_error)
        11.94s   = Training   runtime
        0.08s    = Validation runtime
Fitting model: NeuralNetFastAI_BAG_L2 … Training model for up to 431.44s of
the 1122.14s of remaining time.
        Fitting 8 child models (S2F1 - S2F8) | Fitting with
ParallelLocalFoldFittingStrategy
        -17.8693         = Validation score   (-mean_absolute_error)
        60.77s   = Training   runtime
        0.77s    = Validation runtime
Fitting model: XGBoost_BAG_L2 … Training model for up to 399.31s of the
1090.01s of remaining time.
        Fitting 8 child models (S2F1 - S2F8) | Fitting with
ParallelLocalFoldFittingStrategy
        -17.9658         = Validation score   (-mean_absolute_error)
        5.69s    = Training   runtime
        0.2s     = Validation runtime
Fitting model: NeuralNetTorch_BAG_L2 … Training model for up to 395.12s of the
1085.82s of remaining time.
        Fitting 8 child models (S2F1 - S2F8) | Fitting with
ParallelLocalFoldFittingStrategy
        -17.9333         = Validation score   (-mean_absolute_error)
        76.3s    = Training   runtime
        0.97s    = Validation runtime
Fitting model: LightGBMLarge_BAG_L2 … Training model for up to 352.9s of the
1043.6s of remaining time.
        Fitting 8 child models (S2F1 - S2F8) | Fitting with
ParallelLocalFoldFittingStrategy
        -18.1146         = Validation score   (-mean_absolute_error)
        12.75s   = Training   runtime
        0.37s    = Validation runtime
Repeating k-fold bagging: 3/20
Fitting model: LightGBMXT_BAG_L2 … Training model for up to 345.27s of the
1035.97s of remaining time.
        Fitting 8 child models (S3F1 - S3F8) | Fitting with
```

```
ParallelLocalFoldFittingStrategy
        -18.202  = Validation score   (-mean_absolute_error)
        6.81s    = Training   runtime
        0.37s    = Validation runtime
Fitting model: LightGBM_BAG_L2 … Training model for up to 341.56s of the
1032.26s of remaining time.
        Fitting 8 child models (S3F1 - S3F8) | Fitting with
ParallelLocalFoldFittingStrategy
        -18.0701         = Validation score   (-mean_absolute_error)
        5.96s    = Training   runtime
        0.21s    = Validation runtime
Fitting model: CatBoost_BAG_L2 … Training model for up to 338.34s of the
1029.04s of remaining time.
        Fitting 8 child models (S3F1 - S3F8) | Fitting with
ParallelLocalFoldFittingStrategy
        -18.2557         = Validation score   (-mean_absolute_error)
        17.18s   = Training   runtime
        0.11s    = Validation runtime
Fitting model: NeuralNetFastAI_BAG_L2 … Training model for up to 331.78s of
the 1022.48s of remaining time.
        Fitting 8 child models (S3F1 - S3F8) | Fitting with
ParallelLocalFoldFittingStrategy
        -17.8438         = Validation score   (-mean_absolute_error)
        91.5s    = Training   runtime
        1.25s    = Validation runtime
Fitting model: XGBoost_BAG_L2 … Training model for up to 299.76s of the
990.45s of remaining time.
        Fitting 8 child models (S3F1 - S3F8) | Fitting with
ParallelLocalFoldFittingStrategy
        -17.9045         = Validation score   (-mean_absolute_error)
        9.05s    = Training   runtime
        0.31s    = Validation runtime
Fitting model: NeuralNetTorch_BAG_L2 … Training model for up to 295.12s of the
985.82s of remaining time.
        Fitting 8 child models (S3F1 - S3F8) | Fitting with
ParallelLocalFoldFittingStrategy
        -17.9161         = Validation score   (-mean_absolute_error)
        114.72s  = Training   runtime
        1.47s    = Validation runtime
Fitting model: LightGBMLarge_BAG_L2 … Training model for up to 255.42s of the
946.12s of remaining time.
        Fitting 8 child models (S3F1 - S3F8) | Fitting with
ParallelLocalFoldFittingStrategy
        -18.0723         = Validation score   (-mean_absolute_error)
        18.71s   = Training   runtime
        0.57s    = Validation runtime
Repeating k-fold bagging: 4/20
Fitting model: LightGBMXT_BAG_L2 … Training model for up to 248.16s of the
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938.87s of remaining time.
        Fitting 8 child models (S4F1 - S4F8) | Fitting with
ParallelLocalFoldFittingStrategy
        -18.1958         = Validation score   (-mean_absolute_error)
        9.06s    = Training   runtime
        0.48s    = Validation runtime
Fitting model: LightGBM_BAG_L2 … Training model for up to 244.52s of the
935.22s of remaining time.
        Fitting 8 child models (S4F1 - S4F8) | Fitting with
ParallelLocalFoldFittingStrategy
        -18.0659         = Validation score   (-mean_absolute_error)
        7.92s    = Training   runtime
        0.28s    = Validation runtime
Fitting model: CatBoost_BAG_L2 … Training model for up to 241.28s of the
931.98s of remaining time.
        Fitting 8 child models (S4F1 - S4F8) | Fitting with
ParallelLocalFoldFittingStrategy
        -18.251  = Validation score   (-mean_absolute_error)
        22.75s   = Training   runtime
        0.14s    = Validation runtime
Fitting model: NeuralNetFastAI_BAG_L2 … Training model for up to 234.43s of
the 925.13s of remaining time.
        Fitting 8 child models (S4F1 - S4F8) | Fitting with
ParallelLocalFoldFittingStrategy
        -17.8058         = Validation score   (-mean_absolute_error)
        122.61s  = Training   runtime
        1.63s    = Validation runtime
Fitting model: XGBoost_BAG_L2 … Training model for up to 202.06s of the
892.76s of remaining time.
        Fitting 8 child models (S4F1 - S4F8) | Fitting with
ParallelLocalFoldFittingStrategy
        -17.9006         = Validation score   (-mean_absolute_error)
        12.06s   = Training   runtime
        0.41s    = Validation runtime
Fitting model: NeuralNetTorch_BAG_L2 … Training model for up to 197.73s of the
888.43s of remaining time.
        Fitting 8 child models (S4F1 - S4F8) | Fitting with
ParallelLocalFoldFittingStrategy
        -17.8654         = Validation score   (-mean_absolute_error)
        163.61s  = Training   runtime
        1.99s    = Validation runtime
Fitting model: LightGBMLarge_BAG_L2 … Training model for up to 147.61s of the
838.31s of remaining time.
        Fitting 8 child models (S4F1 - S4F8) | Fitting with
ParallelLocalFoldFittingStrategy
        -18.0077         = Validation score   (-mean_absolute_error)
        24.66s   = Training   runtime
        0.74s    = Validation runtime
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Repeating k-fold bagging: 5/20
Fitting model: LightGBMXT_BAG_L2 … Training model for up to 140.4s of the
831.1s of remaining time.
        Fitting 8 child models (S5F1 - S5F8) | Fitting with
ParallelLocalFoldFittingStrategy
        -18.2012         = Validation score   (-mean_absolute_error)
        11.07s   = Training   runtime
        0.61s    = Validation runtime
Fitting model: LightGBM_BAG_L2 … Training model for up to 137.12s of the
827.82s of remaining time.
        Fitting 8 child models (S5F1 - S5F8) | Fitting with
ParallelLocalFoldFittingStrategy
        -18.0591         = Validation score   (-mean_absolute_error)
        9.82s    = Training   runtime
        0.35s    = Validation runtime
Fitting model: CatBoost_BAG_L2 … Training model for up to 133.93s of the
824.63s of remaining time.
        Fitting 8 child models (S5F1 - S5F8) | Fitting with
ParallelLocalFoldFittingStrategy
        -18.2225         = Validation score   (-mean_absolute_error)
        29.46s   = Training   runtime
        0.18s    = Validation runtime
Fitting model: NeuralNetFastAI_BAG_L2 … Training model for up to 126.07s of
the 816.77s of remaining time.
        Fitting 8 child models (S5F1 - S5F8) | Fitting with
ParallelLocalFoldFittingStrategy
        -17.7777         = Validation score   (-mean_absolute_error)
        153.23s  = Training   runtime
        2.01s    = Validation runtime
Fitting model: XGBoost_BAG_L2 … Training model for up to 94.17s of the 784.87s
of remaining time.
        Fitting 8 child models (S5F1 - S5F8) | Fitting with
ParallelLocalFoldFittingStrategy
        -17.8695         = Validation score   (-mean_absolute_error)
        15.02s   = Training   runtime
        0.51s    = Validation runtime
Fitting model: NeuralNetTorch_BAG_L2 … Training model for up to 89.85s of the
780.55s of remaining time.
        Fitting 8 child models (S5F1 - S5F8) | Fitting with
ParallelLocalFoldFittingStrategy
        -17.84   = Validation score   (-mean_absolute_error)
        211.09s  = Training   runtime
        2.47s    = Validation runtime
Fitting model: LightGBMLarge_BAG_L2 … Training model for up to 40.99s of the
731.69s of remaining time.
        Fitting 8 child models (S5F1 - S5F8) | Fitting with
ParallelLocalFoldFittingStrategy
        -18.0074         = Validation score   (-mean_absolute_error)
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        31.23s   = Training   runtime
        0.96s    = Validation runtime
Completed 5/20 k-fold bagging repeats …
Fitting model: WeightedEnsemble_L3 … Training model for up to 360.0s of the
723.76s of remaining time.
        -17.5124         = Validation score   (-mean_absolute_error)
        0.55s    = Training   runtime
        0.0s     = Validation runtime
Fitting 9 L3 models …
Fitting model: LightGBMXT_BAG_L3 … Training model for up to 482.0s of the
723.17s of remaining time.
        Fitting 8 child models (S1F1 - S1F8) | Fitting with
ParallelLocalFoldFittingStrategy
        -18.3103         = Validation score   (-mean_absolute_error)
        1.75s    = Training   runtime
        0.07s    = Validation runtime
Fitting model: LightGBM_BAG_L3 … Training model for up to 479.01s of the
720.18s of remaining time.
        Fitting 8 child models (S1F1 - S1F8) | Fitting with
ParallelLocalFoldFittingStrategy
        -18.3048         = Validation score   (-mean_absolute_error)
        1.83s    = Training   runtime
        0.06s    = Validation runtime
Fitting model: RandomForestMSE_BAG_L3 … Training model for up to 475.85s of
the 717.02s of remaining time.
        -18.0152         = Validation score   (-mean_absolute_error)
        8.61s    = Training   runtime
        0.82s    = Validation runtime
Fitting model: CatBoost_BAG_L3 … Training model for up to 466.11s of the
707.28s of remaining time.
        Fitting 8 child models (S1F1 - S1F8) | Fitting with
ParallelLocalFoldFittingStrategy
        -18.2105         = Validation score   (-mean_absolute_error)
        3.5s     = Training   runtime
        0.03s    = Validation runtime
Fitting model: ExtraTreesMSE_BAG_L3 … Training model for up to 461.41s of the
702.59s of remaining time.
        -17.9416         = Validation score   (-mean_absolute_error)
        1.58s    = Training   runtime
        0.82s    = Validation runtime
Fitting model: NeuralNetFastAI_BAG_L3 … Training model for up to 458.67s of
the 699.84s of remaining time.
        Fitting 8 child models (S1F1 - S1F8) | Fitting with
ParallelLocalFoldFittingStrategy
        -18.0828         = Validation score   (-mean_absolute_error)
        30.58s   = Training   runtime
        0.38s    = Validation runtime
Fitting model: XGBoost_BAG_L3 … Training model for up to 426.85s of the
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668.02s of remaining time.
        Fitting 8 child models (S1F1 - S1F8) | Fitting with
ParallelLocalFoldFittingStrategy
        -18.2138         = Validation score   (-mean_absolute_error)
        2.59s    = Training   runtime
        0.1s     = Validation runtime
Fitting model: NeuralNetTorch_BAG_L3 … Training model for up to 422.73s of the
663.9s of remaining time.
        Fitting 8 child models (S1F1 - S1F8) | Fitting with
ParallelLocalFoldFittingStrategy
        -17.9311         = Validation score   (-mean_absolute_error)
        32.89s   = Training   runtime
        0.46s    = Validation runtime
Fitting model: LightGBMLarge_BAG_L3 … Training model for up to 388.62s of the
629.79s of remaining time.
        Fitting 8 child models (S1F1 - S1F8) | Fitting with
ParallelLocalFoldFittingStrategy
        -18.3507         = Validation score   (-mean_absolute_error)
        5.53s    = Training   runtime
        0.17s    = Validation runtime
Repeating k-fold bagging: 2/20
Fitting model: LightGBMXT_BAG_L3 … Training model for up to 381.86s of the
623.03s of remaining time.
        Fitting 8 child models (S2F1 - S2F8) | Fitting with
ParallelLocalFoldFittingStrategy
        -18.2389         = Validation score   (-mean_absolute_error)
        3.49s    = Training   runtime
        0.15s    = Validation runtime
Fitting model: LightGBM_BAG_L3 … Training model for up to 378.81s of the
619.99s of remaining time.
        Fitting 8 child models (S2F1 - S2F8) | Fitting with
ParallelLocalFoldFittingStrategy
        -18.182  = Validation score   (-mean_absolute_error)
        3.69s    = Training   runtime
        0.13s    = Validation runtime
Fitting model: CatBoost_BAG_L3 … Training model for up to 375.7s of the
616.88s of remaining time.
        Fitting 8 child models (S2F1 - S2F8) | Fitting with
ParallelLocalFoldFittingStrategy
        -18.1779         = Validation score   (-mean_absolute_error)
        6.96s    = Training   runtime
        0.07s    = Validation runtime
Fitting model: NeuralNetFastAI_BAG_L3 … Training model for up to 370.97s of
the 612.14s of remaining time.
        Fitting 8 child models (S2F1 - S2F8) | Fitting with
ParallelLocalFoldFittingStrategy
        -17.8676         = Validation score   (-mean_absolute_error)
        60.52s   = Training   runtime
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        0.8s     = Validation runtime
Fitting model: XGBoost_BAG_L3 … Training model for up to 339.55s of the
580.72s of remaining time.
        Fitting 8 child models (S2F1 - S2F8) | Fitting with
ParallelLocalFoldFittingStrategy
        -18.0992         = Validation score   (-mean_absolute_error)
        5.12s    = Training   runtime
        0.19s    = Validation runtime
Fitting model: NeuralNetTorch_BAG_L3 … Training model for up to 335.55s of the
576.72s of remaining time.
        Fitting 8 child models (S2F1 - S2F8) | Fitting with
ParallelLocalFoldFittingStrategy
        -17.824  = Validation score   (-mean_absolute_error)
        69.36s   = Training   runtime
        0.94s    = Validation runtime
Fitting model: LightGBMLarge_BAG_L3 … Training model for up to 297.77s of the
538.94s of remaining time.
        Fitting 8 child models (S2F1 - S2F8) | Fitting with
ParallelLocalFoldFittingStrategy
        -18.1874         = Validation score   (-mean_absolute_error)
        11.63s   = Training   runtime
        0.35s    = Validation runtime
Repeating k-fold bagging: 3/20
Fitting model: LightGBMXT_BAG_L3 … Training model for up to 290.37s of the
531.55s of remaining time.
        Fitting 8 child models (S3F1 - S3F8) | Fitting with
ParallelLocalFoldFittingStrategy
        -18.2125         = Validation score   (-mean_absolute_error)
        5.34s    = Training   runtime
        0.23s    = Validation runtime
Fitting model: LightGBM_BAG_L3 … Training model for up to 287.35s of the
528.52s of remaining time.
        Fitting 8 child models (S3F1 - S3F8) | Fitting with
ParallelLocalFoldFittingStrategy
        -18.1637         = Validation score   (-mean_absolute_error)
        5.51s    = Training   runtime
        0.19s    = Validation runtime
Fitting model: CatBoost_BAG_L3 … Training model for up to 284.14s of the
525.31s of remaining time.
        Fitting 8 child models (S3F1 - S3F8) | Fitting with
ParallelLocalFoldFittingStrategy
        -18.1915         = Validation score   (-mean_absolute_error)
        10.45s   = Training   runtime
        0.1s     = Validation runtime
Fitting model: NeuralNetFastAI_BAG_L3 … Training model for up to 279.38s of
the 520.55s of remaining time.
        Fitting 8 child models (S3F1 - S3F8) | Fitting with
ParallelLocalFoldFittingStrategy
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        -17.8018         = Validation score   (-mean_absolute_error)
        91.09s   = Training   runtime
        1.19s    = Validation runtime
Fitting model: XGBoost_BAG_L3 … Training model for up to 247.52s of the 488.7s
of remaining time.
        Fitting 8 child models (S3F1 - S3F8) | Fitting with
ParallelLocalFoldFittingStrategy
        -18.0277         = Validation score   (-mean_absolute_error)
        7.7s     = Training   runtime
        0.28s    = Validation runtime
Fitting model: NeuralNetTorch_BAG_L3 … Training model for up to 243.48s of the
484.65s of remaining time.
        Fitting 8 child models (S3F1 - S3F8) | Fitting with
ParallelLocalFoldFittingStrategy
        -17.799  = Validation score   (-mean_absolute_error)
        107.69s  = Training   runtime
        1.39s    = Validation runtime
Fitting model: LightGBMLarge_BAG_L3 … Training model for up to 203.9s of the
445.07s of remaining time.
        Fitting 8 child models (S3F1 - S3F8) | Fitting with
ParallelLocalFoldFittingStrategy
        -18.1629         = Validation score   (-mean_absolute_error)
        17.23s   = Training   runtime
        0.51s    = Validation runtime
Repeating k-fold bagging: 4/20
Fitting model: LightGBMXT_BAG_L3 … Training model for up to 197.07s of the
438.24s of remaining time.
        Fitting 8 child models (S4F1 - S4F8) | Fitting with
ParallelLocalFoldFittingStrategy
        -18.2044         = Validation score   (-mean_absolute_error)
        7.27s    = Training   runtime
        0.31s    = Validation runtime
Fitting model: LightGBM_BAG_L3 … Training model for up to 193.95s of the
435.12s of remaining time.
        Fitting 8 child models (S4F1 - S4F8) | Fitting with
ParallelLocalFoldFittingStrategy
        -18.159  = Validation score   (-mean_absolute_error)
        7.44s    = Training   runtime
        0.26s    = Validation runtime
Fitting model: CatBoost_BAG_L3 … Training model for up to 190.78s of the
431.95s of remaining time.
        Fitting 8 child models (S4F1 - S4F8) | Fitting with
ParallelLocalFoldFittingStrategy
        -18.1831         = Validation score   (-mean_absolute_error)
        15.08s   = Training   runtime
        0.14s    = Validation runtime
Fitting model: NeuralNetFastAI_BAG_L3 … Training model for up to 185.0s of the
426.17s of remaining time.
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        Fitting 8 child models (S4F1 - S4F8) | Fitting with
ParallelLocalFoldFittingStrategy
        -17.7823        = Validation score   (-mean_absolute_error)
        121.41s  = Training   runtime
        1.59s    = Validation runtime
Fitting model: XGBoost_BAG_L3 … Training model for up to 153.32s of the
394.49s of remaining time.
        Fitting 8 child models (S4F1 - S4F8) | Fitting with
ParallelLocalFoldFittingStrategy
        -18.0249        = Validation score   (-mean_absolute_error)
        10.51s   = Training   runtime
        0.36s    = Validation runtime
Fitting model: NeuralNetTorch_BAG_L3 … Training model for up to 149.3s of the
390.47s of remaining time.
        Fitting 8 child models (S4F1 - S4F8) | Fitting with
ParallelLocalFoldFittingStrategy
        -17.7696        = Validation score   (-mean_absolute_error)
        147.01s  = Training   runtime
        1.83s    = Validation runtime
Fitting model: LightGBMLarge_BAG_L3 … Training model for up to 108.67s of the
349.84s of remaining time.
        Fitting 8 child models (S4F1 - S4F8) | Fitting with
ParallelLocalFoldFittingStrategy
        -18.1294        = Validation score   (-mean_absolute_error)
        23.77s   = Training   runtime
        0.69s    = Validation runtime
Completed 4/20 k-fold bagging repeats …
Fitting model: WeightedEnsemble_L4 … Training model for up to 360.0s of the
342.0s of remaining time.
        -17.5764        = Validation score   (-mean_absolute_error)
        0.53s    = Training   runtime
        0.0s     = Validation runtime
Fitting 9 L4 models …
Fitting model: LightGBMXT_BAG_L4 … Training model for up to 341.45s of the
341.43s of remaining time.
        Fitting 8 child models (S1F1 - S1F8) | Fitting with
ParallelLocalFoldFittingStrategy
        -18.408  = Validation score   (-mean_absolute_error)
        1.73s    = Training   runtime
        0.08s    = Validation runtime
Fitting model: LightGBM_BAG_L4 … Training model for up to 338.49s of the
338.48s of remaining time.
        Fitting 8 child models (S1F1 - S1F8) | Fitting with
ParallelLocalFoldFittingStrategy
        -18.1731        = Validation score   (-mean_absolute_error)
        2.23s    = Training   runtime
        0.09s    = Validation runtime
Fitting model: RandomForestMSE_BAG_L4 … Training model for up to 334.95s of
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the 334.94s of remaining time.
        -17.9208        = Validation score   (-mean_absolute_error)
        8.73s    = Training   runtime
        0.81s    = Validation runtime
Fitting model: CatBoost_BAG_L4 … Training model for up to 325.1s of the
325.08s of remaining time.
        Fitting 8 child models (S1F1 - S1F8) | Fitting with
ParallelLocalFoldFittingStrategy
        -18.3522        = Validation score   (-mean_absolute_error)
        3.4s     = Training   runtime
        0.03s    = Validation runtime
Fitting model: ExtraTreesMSE_BAG_L4 … Training model for up to 320.4s of the
320.39s of remaining time.
        -18.0126        = Validation score   (-mean_absolute_error)
        1.58s    = Training   runtime
        0.83s    = Validation runtime
Fitting model: NeuralNetFastAI_BAG_L4 … Training model for up to 317.65s of
the 317.64s of remaining time.
        Fitting 8 child models (S1F1 - S1F8) | Fitting with
ParallelLocalFoldFittingStrategy
        -18.1121        = Validation score   (-mean_absolute_error)
        29.86s   = Training   runtime
        0.43s    = Validation runtime
Fitting model: XGBoost_BAG_L4 … Training model for up to 286.53s of the
286.52s of remaining time.
        Fitting 8 child models (S1F1 - S1F8) | Fitting with
ParallelLocalFoldFittingStrategy
        -17.9991        = Validation score   (-mean_absolute_error)
        2.83s    = Training   runtime
        0.11s    = Validation runtime
Fitting model: NeuralNetTorch_BAG_L4 … Training model for up to 282.28s of the
282.26s of remaining time.
        Fitting 8 child models (S1F1 - S1F8) | Fitting with
ParallelLocalFoldFittingStrategy
        -18.0726        = Validation score   (-mean_absolute_error)
        39.04s   = Training   runtime
        0.46s    = Validation runtime
Fitting model: LightGBMLarge_BAG_L4 … Training model for up to 241.79s of the
241.78s of remaining time.
        Fitting 8 child models (S1F1 - S1F8) | Fitting with
ParallelLocalFoldFittingStrategy
        -18.1924        = Validation score   (-mean_absolute_error)
        5.39s    = Training   runtime
        0.15s    = Validation runtime
Repeating k-fold bagging: 2/20
Fitting model: LightGBMXT_BAG_L4 … Training model for up to 235.11s of the
235.1s of remaining time.
        Fitting 8 child models (S2F1 - S2F8) | Fitting with
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ParallelLocalFoldFittingStrategy
        -18.3378         = Validation score   (-mean_absolute_error)
        3.55s    = Training   runtime
        0.16s    = Validation runtime
Fitting model: LightGBM_BAG_L4 … Training model for up to 231.96s of the
231.95s of remaining time.
        Fitting 8 child models (S2F1 - S2F8) | Fitting with
ParallelLocalFoldFittingStrategy
        -18.0505         = Validation score   (-mean_absolute_error)
        4.38s    = Training   runtime
        0.16s    = Validation runtime
Fitting model: CatBoost_BAG_L4 … Training model for up to 228.57s of the
228.55s of remaining time.
        Fitting 8 child models (S2F1 - S2F8) | Fitting with
ParallelLocalFoldFittingStrategy
        -18.2881         = Validation score   (-mean_absolute_error)
        6.97s    = Training   runtime
        0.07s    = Validation runtime
Fitting model: NeuralNetFastAI_BAG_L4 … Training model for up to 223.73s of
the 223.71s of remaining time.
        Fitting 8 child models (S2F1 - S2F8) | Fitting with
ParallelLocalFoldFittingStrategy
        -17.9711         = Validation score   (-mean_absolute_error)
        59.98s   = Training   runtime
        0.82s    = Validation runtime
Fitting model: XGBoost_BAG_L4 … Training model for up to 192.25s of the
192.24s of remaining time.
        Fitting 8 child models (S2F1 - S2F8) | Fitting with
ParallelLocalFoldFittingStrategy
        -17.9325         = Validation score   (-mean_absolute_error)
        5.68s    = Training   runtime
        0.2s     = Validation runtime
Fitting model: NeuralNetTorch_BAG_L4 … Training model for up to 188.18s of the
188.17s of remaining time.
        Fitting 8 child models (S2F1 - S2F8) | Fitting with
ParallelLocalFoldFittingStrategy
        -17.9687         = Validation score   (-mean_absolute_error)
        72.02s   = Training   runtime
        0.95s    = Validation runtime
Fitting model: LightGBMLarge_BAG_L4 … Training model for up to 153.8s of the
153.79s of remaining time.
        Fitting 8 child models (S2F1 - S2F8) | Fitting with
ParallelLocalFoldFittingStrategy
        -18.0734         = Validation score   (-mean_absolute_error)
        11.69s   = Training   runtime
        0.35s    = Validation runtime
Repeating k-fold bagging: 3/20
Fitting model: LightGBMXT_BAG_L4 … Training model for up to 146.18s of the
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146.17s of remaining time.
        Fitting 8 child models (S3F1 - S3F8) | Fitting with
ParallelLocalFoldFittingStrategy
        -18.288  = Validation score   (-mean_absolute_error)
        5.28s    = Training   runtime
        0.24s    = Validation runtime
Fitting model: LightGBM_BAG_L4 … Training model for up to 143.2s of the
143.19s of remaining time.
        Fitting 8 child models (S3F1 - S3F8) | Fitting with
ParallelLocalFoldFittingStrategy
        -17.9906         = Validation score   (-mean_absolute_error)
        6.46s    = Training   runtime
        0.25s    = Validation runtime
Fitting model: CatBoost_BAG_L4 … Training model for up to 139.86s of the
139.85s of remaining time.
        Fitting 8 child models (S3F1 - S3F8) | Fitting with
ParallelLocalFoldFittingStrategy
        -18.2472         = Validation score   (-mean_absolute_error)
        11.22s   = Training   runtime
        0.11s    = Validation runtime
Fitting model: NeuralNetFastAI_BAG_L4 … Training model for up to 134.36s of
the 134.34s of remaining time.
        Fitting 8 child models (S3F1 - S3F8) | Fitting with
ParallelLocalFoldFittingStrategy
        -17.9235         = Validation score   (-mean_absolute_error)
        90.3s    = Training   runtime
        1.2s     = Validation runtime
Fitting model: XGBoost_BAG_L4 … Training model for up to 102.78s of the
102.77s of remaining time.
        Fitting 8 child models (S3F1 - S3F8) | Fitting with
ParallelLocalFoldFittingStrategy
        -17.8802         = Validation score   (-mean_absolute_error)
        8.5s     = Training   runtime
        0.3s     = Validation runtime
Fitting model: NeuralNetTorch_BAG_L4 … Training model for up to 98.57s of the
98.56s of remaining time.
        Fitting 8 child models (S3F1 - S3F8) | Fitting with
ParallelLocalFoldFittingStrategy
        -17.9254         = Validation score   (-mean_absolute_error)
        106.78s  = Training   runtime
        1.38s    = Validation runtime
Fitting model: LightGBMLarge_BAG_L4 … Training model for up to 62.43s of the
62.42s of remaining time.
        Fitting 8 child models (S3F1 - S3F8) | Fitting with
ParallelLocalFoldFittingStrategy
        -17.9937         = Validation score   (-mean_absolute_error)
        17.81s   = Training   runtime
        0.54s    = Validation runtime
```

```
Completed 3/20 k-fold bagging repeats …
Fitting model: WeightedEnsemble_L5 … Training model for up to 360.0s of the
54.95s of remaining time.
        -17.6017         = Validation score   (-mean_absolute_error)
        0.52s    = Training   runtime
        0.0s     = Validation runtime
AutoGluon training complete, total runtime = 1745.61s … Best model:
"WeightedEnsemble_L3"
TabularPredictor saved. To load, use: predictor =
TabularPredictor.load("AutogluonModels/submission_87_C/")
Evaluation: mean_absolute_error on test data: -32.428775502249124
        Note: Scores are always higher_is_better. This metric score can be
multiplied by -1 to get the metric value.
Evaluations on test data:
{
    "mean_absolute_error": -32.428775502249124,
    "root_mean_squared_error": -66.53687489719019,
    "mean_squared_error": -4427.155721084338,
    "r2": 0.7678834316810559,
    "pearsonr": 0.8923321954787814,
    "median_absolute_error": -1.9803193473815925
}

Evaluation on test data:
-32.428775502249124
```

3 Submit

[12]:
```
import pandas as pd
import matplotlib.pyplot as plt

train_data_with_dates = TabularDataset('X_train_raw.csv')
train_data_with_dates["ds"] = pd.to_datetime(train_data_with_dates["ds"])

test_data = TabularDataset('X_test_raw.csv')
test_data["ds"] = pd.to_datetime(test_data["ds"])
#test_data
```

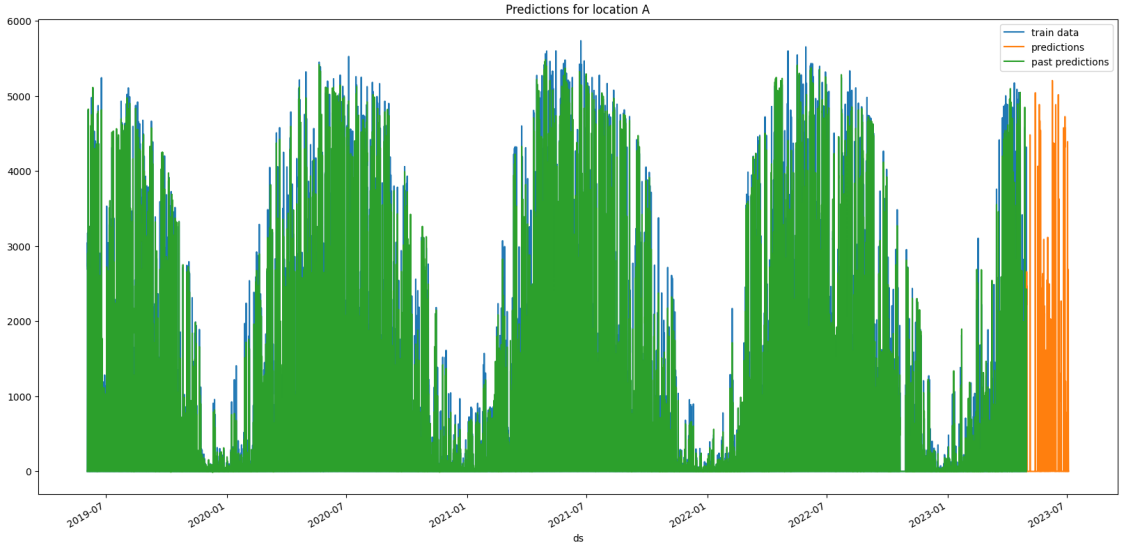
```
Loaded data from: X_train_raw.csv | Columns = 48 / 48 | Rows = 92951 -> 92951
Loaded data from: X_test_raw.csv | Columns = 47 / 47 | Rows = 2160 -> 2160
```

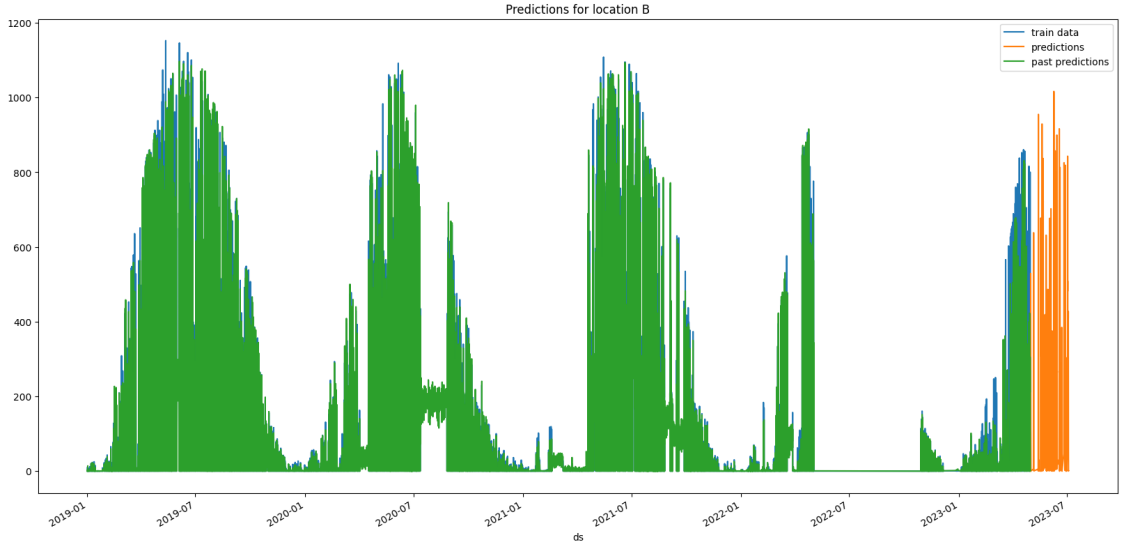
[13]:
```
test_ids = TabularDataset('test.csv')
test_ids["time"] = pd.to_datetime(test_ids["time"])
# merge test_data with test_ids
test_data_merged = pd.merge(test_data, test_ids, how="inner", right_on=["time",␣
 ↪"location"], left_on=["ds", "location"])

#test_data_merged
```

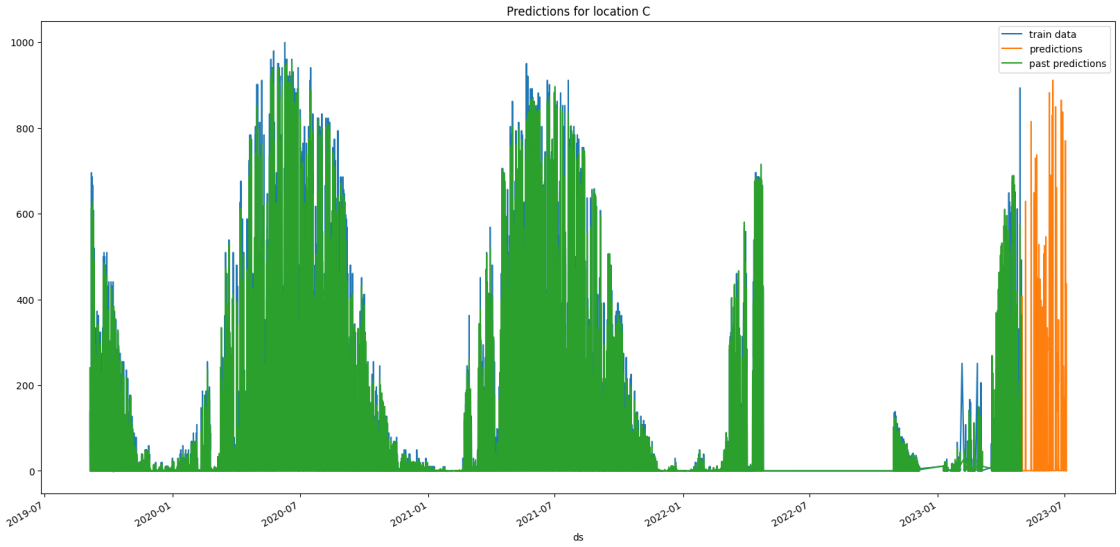
```
Loaded data from: test.csv | Columns = 4 / 4 | Rows = 2160 -> 2160
```

[14]:
```python
# predict, grouped by location
predictions = []
location_map = {
    "A": 0,
    "B": 1,
    "C": 2
}
for loc, group in test_data.groupby('location'):
    i = location_map[loc]
    subset = test_data_merged[test_data_merged["location"] == loc].
 ↪reset_index(drop=True)
    #print(subset)
    pred = predictors[i].predict(subset)
    subset["prediction"] = pred
    predictions.append(subset)

    # get past predictions
    past_pred = predictors[i].
 ↪predict(train_data_with_dates[train_data_with_dates["location"] == loc])
    train_data_with_dates.loc[train_data_with_dates["location"] == loc,␣
 ↪"prediction"] = past_pred
```

[ ]:
```python
# plot predictions for location A, in addition to train data for A
for loc, idx in location_map.items():
    fig, ax = plt.subplots(figsize=(20, 10))
    # plot train data
    train_data_with_dates[train_data_with_dates["location"]==loc].plot(x='ds',␣
 ↪y='y', ax=ax, label="train data")

    # plot predictions
    predictions[idx].plot(x='ds', y='prediction', ax=ax, label="predictions")

    # plot past predictions
    train_data_with_dates[train_data_with_dates["location"]==loc].plot(x='ds',␣
 ↪y='prediction', ax=ax, label="past predictions")

    # title
    ax.set_title(f"Predictions for location {loc}")
```


Predictions for location A
train data
predictions
past predictions
6000
5000
4000
3000
2000
1000
0
2019-07
2020-01
2020-07
2021-01
2021-07
2022-01
2022-07
2023-01
2023-07
ds


Predictions for location B
train data
predictions
past predictions
1200
1000
800
600
400
200
0
2019-01
2019-07
2020-01
2020-07
2021-01
2021-07
2022-01
2022-07
2023-01
2023-07
ds



[ ]:
```
# concatenate predictions
submissions_df = pd.concat(predictions)
submissions_df = submissions_df[["id", "prediction"]]
submissions_df
```

[ ]:
```
        id  prediction
0        0    0.052862
1        1    0.025646
2        2    0.282165
3        3   24.532543
4        4  332.946320
..     …          …
715   2155   50.575989
716   2156   29.534914
717   2157   10.595109
718   2158    0.503285
719   2159    0.293439

[2160 rows x 2 columns]
```

[ ]:
```
# Save the submission DataFrame to submissions folder, create new name based on␣
 ↪last submission, format is submission_<last_submission_number + 1>.csv

# Save the submission
print(f"Saving submission to submissions/{new_filename}.csv")
submissions_df.to_csv(os.path.join('submissions', f"{new_filename}.csv"),␣
 ↪index=False)
print("jall1a")
```

```
Saving submission to submissions/submission_87.csv
jall1a
```

[ ]:
```
# save this running notebook
from IPython.display import display, Javascript
import time

# hei123

display(Javascript("IPython.notebook.save_checkpoint();"))

time.sleep(3)
```

```
<IPython.core.display.Javascript object>
```

[ ]:
```
# save this notebook to submissions folder
import subprocess
import os
subprocess.run(["jupyter", "nbconvert", "--to", "pdf", "--output", os.path.
 ↪join('notebook_pdfs', f"{new_filename}.pdf"), "autogluon_each_location.
 ↪ipynb"])
```

```
[NbConvertApp] Converting notebook autogluon_each_location.ipynb to pdf
/opt/conda/lib/python3.10/site-packages/nbconvert/utils/pandoc.py:51:
RuntimeWarning: You are using an unsupported version of pandoc (2.9.2.1).
Your version must be at least (2.14.2) but less than (4.0.0).
Refer to https://pandoc.org/installing.html.
Continuing with doubts…
  check_pandoc_version()
[NbConvertApp] Writing 192840 bytes to notebook.tex
[NbConvertApp] Building PDF
[NbConvertApp] Running xelatex 3 times: ['xelatex', 'notebook.tex', '-quiet']
[NbConvertApp] Running bibtex 1 time: ['bibtex', 'notebook']
[NbConvertApp] WARNING | bibtex had problems, most likely because there were no
citations
[NbConvertApp] PDF successfully created
[NbConvertApp] Writing 122947 bytes to notebook_pdfs/submission_87.pdf
```

[ ]:
```
CompletedProcess(args=['jupyter', 'nbconvert', '--to', 'pdf', '--output',
'notebook_pdfs/submission_87.pdf', 'autogluon_each_location.ipynb'],
returncode=0)
```

[ ]:
```
# feature importance
location="A"
split_time = pd.Timestamp("2022-10-28 22:00:00")
estimated = train_data_with_dates[train_data_with_dates["ds"] >= split_time]
estimated = estimated[estimated["location"] == location]
predictors[0].feature_importance(feature_stage="original", data=estimated,␣
 ↪time_limit=60*10)
```

```
These features in provided data are not utilized by the predictor and will be
ignored: ['ds', 'elevation:m', 'sample_weight', 'location', 'prediction']
Computing feature importance via permutation shuffling for 43 features using
4394 rows with 10 shuffle sets… Time limit: 600s…
        14873.71s       = Expected runtime (1487.37s per shuffle set)
        790.5s  = Actual runtime (Completed 1 of 10 shuffle sets) (Early
stopping due to lack of time…)
```

[ ]:

	importance	stddev	p_value	n	p99_high	\
direct_rad:W	1.272873e+02	NaN	NaN	1	NaN	
clear_sky_rad:W	1.004265e+02	NaN	NaN	1	NaN	
diffuse_rad:W	7.640233e+01	NaN	NaN	1	NaN	
sun_azimuth:d	5.516020e+01	NaN	NaN	1	NaN	
sun_elevation:d	3.142228e+01	NaN	NaN	1	NaN	
clear_sky_energy_1h:J	2.474332e+01	NaN	NaN	1	NaN	
direct_rad_1h:J	1.714700e+01	NaN	NaN	1	NaN	
total_cloud_cover:p	1.365735e+01	NaN	NaN	1	NaN	
diffuse_rad_1h:J	8.652264e+00	NaN	NaN	1	NaN	
effective_cloud_cover:p	8.201687e+00	NaN	NaN	1	NaN	
wind_speed_u_10m:ms	7.922932e+00	NaN	NaN	1	NaN	
fresh_snow_24h:cm	5.974738e+00	NaN	NaN	1	NaN	
cloud_base_agl:m	5.555585e+00	NaN	NaN	1	NaN	
ceiling_height_agl:m	4.904986e+00	NaN	NaN	1	NaN	
snow_water:kgm2	4.416810e+00	NaN	NaN	1	NaN	
visibility:m	4.211952e+00	NaN	NaN	1	NaN	
relative_humidity_1000hPa:p	3.696631e+00	NaN	NaN	1	NaN	
is_day:idx	3.029423e+00	NaN	NaN	1	NaN	
wind_speed_v_10m:ms	2.539384e+00	NaN	NaN	1	NaN	
is_in_shadow:idx	2.179261e+00	NaN	NaN	1	NaN	
precip_type_5min:idx	2.088124e+00	NaN	NaN	1	NaN	
wind_speed_10m:ms	1.955832e+00	NaN	NaN	1	NaN	
fresh_snow_12h:cm	1.673554e+00	NaN	NaN	1	NaN	
fresh_snow_3h:cm	1.315131e+00	NaN	NaN	1	NaN	
snow_melt_10min:mm	1.148507e+00	NaN	NaN	1	NaN	
air_density_2m:kgm3	1.106660e+00	NaN	NaN	1	NaN	
msl_pressure:hPa	1.095964e+00	NaN	NaN	1	NaN	
precip_5min:mm	1.008072e+00	NaN	NaN	1	NaN	
fresh_snow_6h:cm	8.228427e-01	NaN	NaN	1	NaN	
sfc_pressure:hPa	6.612831e-01	NaN	NaN	1	NaN	
dew_or_rime:idx	5.754769e-01	NaN	NaN	1	NaN	
snow_depth:cm	5.530230e-01	NaN	NaN	1	NaN	
super_cooled_liquid_water:kgm2	4.648073e-01	NaN	NaN	1	NaN	
dew_point_2m:K	4.103073e-01	NaN	NaN	1	NaN	
t_1000hPa:K	4.095966e-01	NaN	NaN	1	NaN	
fresh_snow_1h:cm	3.565886e-01	NaN	NaN	1	NaN	
rain_water:kgm2	2.631751e-01	NaN	NaN	1	NaN	
prob_rime:p	2.229055e-01	NaN	NaN	1	NaN	

is_estimated	4.510383e-10	NaN	NaN	1	NaN
wind_speed_w_1000hPa:ms	-1.525962e-10	NaN	NaN	1	NaN
pressure_50m:hPa	-1.840237e-01	NaN	NaN	1	NaN
pressure_100m:hPa	-3.961729e-01	NaN	NaN	1	NaN
absolute_humidity_2m:gm3	-5.581854e-01	NaN	NaN	1	NaN

	p99_low
direct_rad:W	NaN
clear_sky_rad:W	NaN
diffuse_rad:W	NaN
sun_azimuth:d	NaN
sun_elevation:d	NaN
clear_sky_energy_1h:J	NaN
direct_rad_1h:J	NaN
total_cloud_cover:p	NaN
diffuse_rad_1h:J	NaN
effective_cloud_cover:p	NaN
wind_speed_u_10m:ms	NaN
fresh_snow_24h:cm	NaN
cloud_base_agl:m	NaN
ceiling_height_agl:m	NaN
snow_water:kgm2	NaN
visibility:m	NaN
relative_humidity_1000hPa:p	NaN
is_day:idx	NaN
wind_speed_v_10m:ms	NaN
is_in_shadow:idx	NaN
precip_type_5min:idx	NaN
wind_speed_10m:ms	NaN
fresh_snow_12h:cm	NaN
fresh_snow_3h:cm	NaN
snow_melt_10min:mm	NaN
air_density_2m:kgm3	NaN
msl_pressure:hPa	NaN
precip_5min:mm	NaN
fresh_snow_6h:cm	NaN
sfc_pressure:hPa	NaN
dew_or_rime:idx	NaN
snow_depth:cm	NaN
super_cooled_liquid_water:kgm2	NaN
dew_point_2m:K	NaN
t_1000hPa:K	NaN
fresh_snow_1h:cm	NaN
rain_water:kgm2	NaN
prob_rime:p	NaN
is_estimated	NaN
wind_speed_w_1000hPa:ms	NaN

```
pressure_50m:hPa                    NaN
pressure_100m:hPa                   NaN
absolute_humidity_2m:gm3            NaN
```

[ ]:
```
# feature importance
observed = train_data_with_dates[train_data_with_dates["ds"] < split_time]
observed = observed[observed["location"] == location]
predictors[0].feature_importance(feature_stage="original", data=observed,␣
 ↪time_limit=60*10)
```

```
These features in provided data are not utilized by the predictor and will be
ignored: ['ds', 'elevation:m', 'sample_weight', 'location', 'prediction']
Computing feature importance via permutation shuffling for 43 features using
5000 rows with 10 shuffle sets… Time limit: 600s…
        16706.46s       = Expected runtime (1670.65s per shuffle set)
```

[ ]:
```
display(Javascript("IPython.notebook.save_checkpoint();"))
time.sleep(3)

subprocess.run(["jupyter", "nbconvert", "--to", "pdf", "--output", os.path.
 ↪join('notebook_pdfs', f"{new_filename}_with_feature_importance.pdf"),␣
 ↪"autogluon_each_location.ipynb"])
```

[ ]:
```
# import subprocess

# def execute_git_command(directory, command):
#     """Execute a Git command in the specified directory."""
#     try:
#         result = subprocess.check_output(['git', '-C', directory] + command,␣
 ↪stderr=subprocess.STDOUT)
#         return result.decode('utf-8').strip(), True
#     except subprocess.CalledProcessError as e:
#         print(f"Git command failed with message: {e.output.decode('utf-8').
 ↪strip()}")
#         return e.output.decode('utf-8').strip(), False

# git_repo_path = "."

# execute_git_command(git_repo_path, ['config', 'user.email',␣
 ↪'henrikskog01@gmail.com'])
# execute_git_command(git_repo_path, ['config', 'user.name', hello if hello is␣
 ↪not None else 'Henrik eller Jørgen'])

# branch_name = new_filename

# # add datetime to branch name
# branch_name += f"_{pd.Timestamp.now().strftime('%Y-%m-%d_%H-%M-%S')}"
```

```
# commit_msg = "run result"

# execute_git_command(git_repo_path, ['checkout', '-b',branch_name])

# # Navigate to your repo and commit changes
# execute_git_command(git_repo_path, ['add', '.'])
# execute_git_command(git_repo_path, ['commit', '-m',commit_msg])

# # Push to remote
# output, success = execute_git_command(git_repo_path, ['push',␣
 ↪'origin',branch_name])

# # If the push fails, try setting an upstream branch and push again
# if not success and 'upstream' in output:
#     print("Attempting to set upstream and push again...")
#     execute_git_command(git_repo_path, ['push', '--set-upstream',␣
 ↪'origin',branch_name])
#     execute_git_command(git_repo_path, ['push', 'origin', 'henrik_branch'])

# execute_git_command(git_repo_path, ['checkout', 'main'])
```